Memoirs of the Museum of Victoria 53(2): 137–220 (1992) 31 December 1992
https://doi.org/10.24199/j.mmv.1992.53.09

THE PSOCOPTERA (INSECTA) OF WILSONS PROMONTORY NATIONAL PARK, VICTORIA, AUSTRALIA

By E. R. Schmidt and I. W. B. Thornton

Department of Zoology, La Trobe University, Bundoora, Victoria 3083, Australia

Abstract

Schmidt, E.R. and Thornton, I.W.B., 1992. The Psocoptera (Insecta) of Wilsons Promontory National Park, Victoria, Australia. *Memoirs of the Museum of Victoria* 53: 137–220.

Psocoptera (psocids) were collected by beating from a wide range of habitat associations at Wilsons Promontory National Park, Victoria. Eleven different habitats were regularly sampled over a 13-month period during 1985-1986 and additional habitats were extensively sampled at other times. Sixty-eight species were collected, representing 25 genera in 11 families. Twenty-four species are newly described and further descriptions provided for nine species. The fauna is richer than that found in surveys of other regions of south-eastern Australia but the α diversity index (α = 10.74) is similar to that found at Muogamarra Nature Reserve, near Sydney, NSW. The large number of plant associations at Wilsons Promontory appears to be the most likely explanation for the relative richness of the psocopteran fauna.

Keywords: Psocoptera; Wilsons Promontory; Bass Strait zoogeography, faunal diversity.

Introduction

The Psocoptera (psocids) is one of the smaller and lesser-known insect orders. About 3500 species of 36 families are known and the insects occur commonly in all zoogeographical regions. Several species are cosmopolitan and others have wide tropical ranges. Many species, however, have limited distributions giving rise to regional faunas. Several islands and archipelagos of the inner and outer Melanesian arcs in the west and south-west Pacific, New Guinea and adjacent Indonesian islands contain such faunas, which recently have prompted inferences concerning systematics and biogeographical distributions (Smithers and Thornton, 1981 and references therein, 1990; Thornton et al., 1988; Thornton, 1989 and references therein).

Surveys of the Muogamarra Nature Reserve, near Sydney (Smithers, 1977), and of South Australia (Smithers, 1984) indicated that the temperate Australian psocopteran fauna is diverse and little known. Earlier records from Victoria are predominantly by New (1973a, 1973b, 1974a, 1974b) and Thornton and New (1977). More recently a survey of two isolated inland regions of Victoria, The Grampians and Mt Arapiles (Endersby et al., 1990) yielded 32 species, raising the known species in Victoria to 61. Investigations of the fauna of the Bass Strait islands (Cole et al., 1989) and the Otway Ranges (Thomas, 1986) have been made and the fauna of Tasmania is currently being studied. A survey of the fauna of south-eastern Australian highland areas was made in early 1990, and is now being analysed.

Mackerras (1970) regarded the insect fauna of south-eastern Australia as comprising predominantly the southern element of Australia's fauna, some groups showing affinities with New Zealand, New Caledonia, southern cool temperate South America and (to a lesser extent) South Africa. These disjunctions appear to reflect historical Gondwanan connections via Antarctica.

Pleistocene lowering of sea level was sufficient to expose a land bridge, the Bassian Rise, connecting southern Victoria via Flinders Island to Tasmania (Blom, 1988; Rawlinson, 1974) (Map A). Changes in world climate, associated vegetation shifts and intermittent land connections probably occurred often, causing repeated isolation and fusion of habitats conducive to speciation. Thus, south-eastern Australia, particularly Tasmania and the Bass Strait region, is an area well suited for investigations of patterns of distribution and evolution of Psocoptera.

Thirty-one described species are known from mainland Tasmania (Edwards, 1950; Hickman, 1934; Smithers, 1979) and 33 from the Bass Strait Islands (Cole et al., 1989; New, 1971). The relationships of the fauna of the Bass Strait islands to those of Tasmania and southern Victoria were assessed by Cole et al. (1989) but several species remain to be described from this survey. In addition, current studies of the faunas of both mainland Tasmania and the areas of southern Victoria mentioned above have

revealed a number of undescribed species in the south-eastern Australian fauna. As a further contribution to our knowledge of Psocoptera in the Bass Strait region, a study was made of the psocopteran fauna of Wilsons Promontory National Park based on a systematic survey over thirteen months.

Study area

Wilsons Promontory, a hilly peninsula 235 km south-east of Melbourne, Victoria (39°S, 146°20′E), is the most southerly part of the Australian mainland (Map A). It was permanently reserved as a national park in 1905 and later additions increased the area of the park to its present size of almost 49 000 hectares. The land rises from sea level to 754 m at the highest peak, Mt Latrobe, and there are a number of other hills of about this height.

Mean annual rainfall at Tidal River is 1080 mm, the maximum occurring in June, the minimum in January. The wettest months are May to August, the driest December to March. Temperatures are moderate and frosts rare. The prevailing wind is from the west in all months except July (north-west), August (north-west and west) and December (west and north-east). Eastern and south-eastern aspects are characterized by lower evapotranspiration rates than western and northwestern aspects. Mean monthly wind speeds show no seasonal trends, varying from 20 to 30 km h^{-1}, similar to those of other exposed coastal locations in southern Australia (Parsons, 1966).

Bass Strait has existed since the early Tertiary. During the Pleistocene the granite peaks of Wilsons Promontory formed part of a range of mountains, the Bassian Rise, linking Tasmania with the mainland through the Hogan, Curtis and Kent Groups of islands to Flinders and Cape Barren Islands (Jennings, 1959) (Map A).

Five major world glacial phases have been recognised since the Pleistocene. In the last three of these (the Illinoian, Early Wisconsin and Late Wisconsin) sea levels fell below minus 80 m, exposing the Bassian Rise (maximum depth 55 m) and the western land bridge extending from Tasmania through King Island to the Mornington Peninsula (maximum depth 67 m) (Blom, 1988). At the peak of the last glacial phase (18 000–20 000 years ago) the sea lay 132–150 m below the present level. Since then the sea level has risen and the present coastline was attained about 5 000 years ago. Western Bass Strait was breached 11 800 years ago and the Bassian Rise of eastern Bass Strait 8 700 years ago (Blom, 1988). The establishment of the land bridges had facilitated faunal interchange between the mainland and Tasmania during periods when the climate was colder than at present (Blom, 1988; Cole et al., 1989; Rawlinson, 1974) and when these were breached the Tasmanian fauna was able to develop in relative isolation. Rises in sea level during the Pleistocene (approximately 120 000 years ago) turned Wilsons Promontory into an island. As a result of the action of wind and tides sand has gradually built up the gap between the island and the mainland, forming the Yanakie Isthmus (Anon, 1984; Edgecombe, 1985).

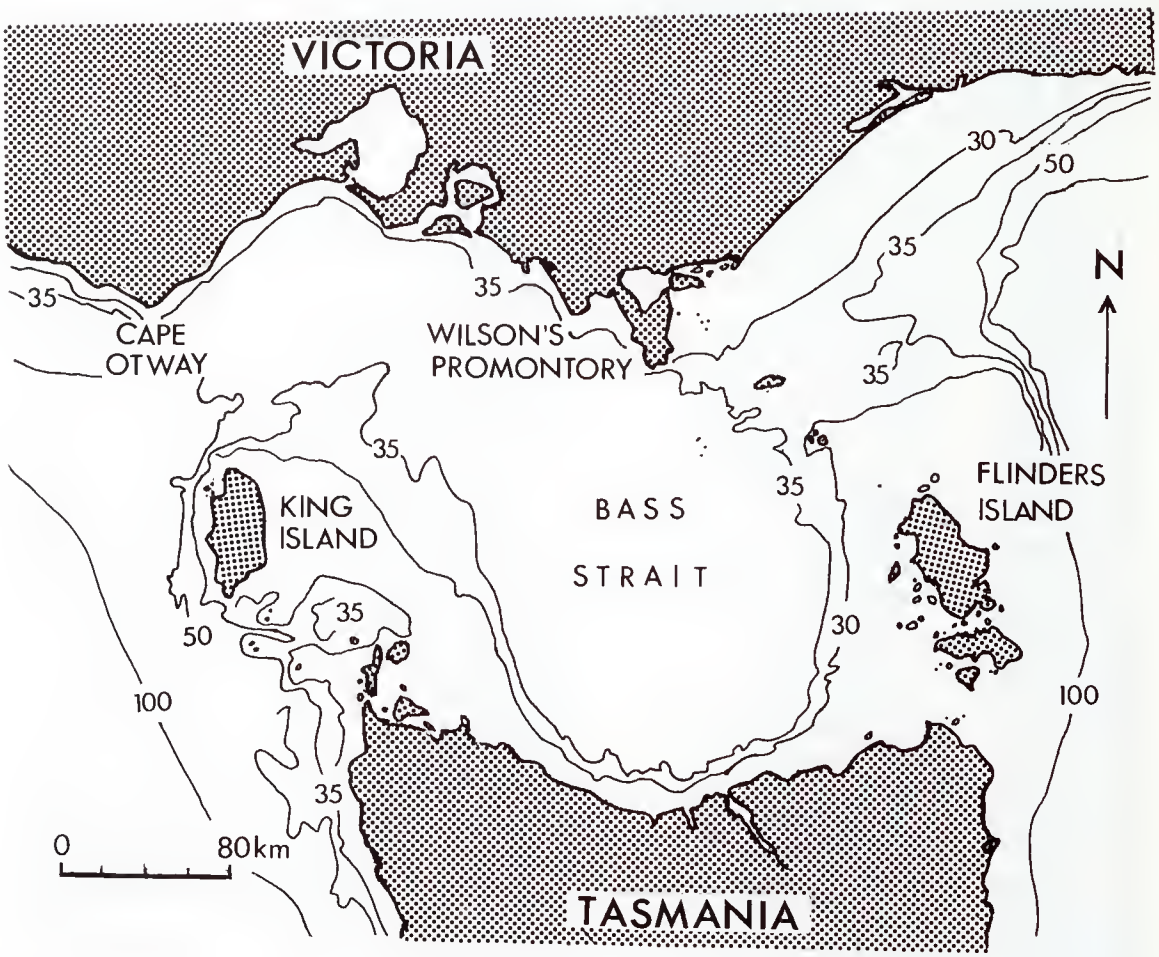
Reed (1959) has summarised the geology of Wilsons Promontory. The promontory is composed of two separate units: granite and recent deposits. Granite outcrops over most of the National Park and forms the bedrock of the area. The rock is a uniform grey, coarse-grained, well-jointed porphyritic granite containing felspar crystals of Devonian age. Recent deposits are confined to small areas of sand dunes, alluvial formations and swamps. Sand dunes are better developed on the western side than on the east, where in general they are restricted to one or two fairly low ridges running parallel to the coast (e.g., Five Mile Beach, Map B). On the western side, sand dunes up to 15 m high occur on the flat and low-lying swampy areas at the heads of bays and inlets where wind-blown sand has been able to accumulate (e.g., at the heads of the neighbouring Leonard, Norman and Oberon Bays). Near the south end of Darby Beach and on parts of the Yanakie grasslands, thick beds of Pleistocene dune limestone lie under recent sand dunes. Alluvial and swamp deposits, consisting mainly of detritus derived from the weathering of granite, extend from the foot of the hills to the coast forming areas of flat, low-lying and usually badly-drained country.

As a result of extensive analysis of aerial photographs, Smith (1978) described 27 different vegetation units in Wilsons Promontory. He described the promontory as constituting the "meeting ground" and often the distributional boundary of plant species from many parts of south-eastern Australia, thus having floristic links with western Victoria, Tasmania and East Gippsland.

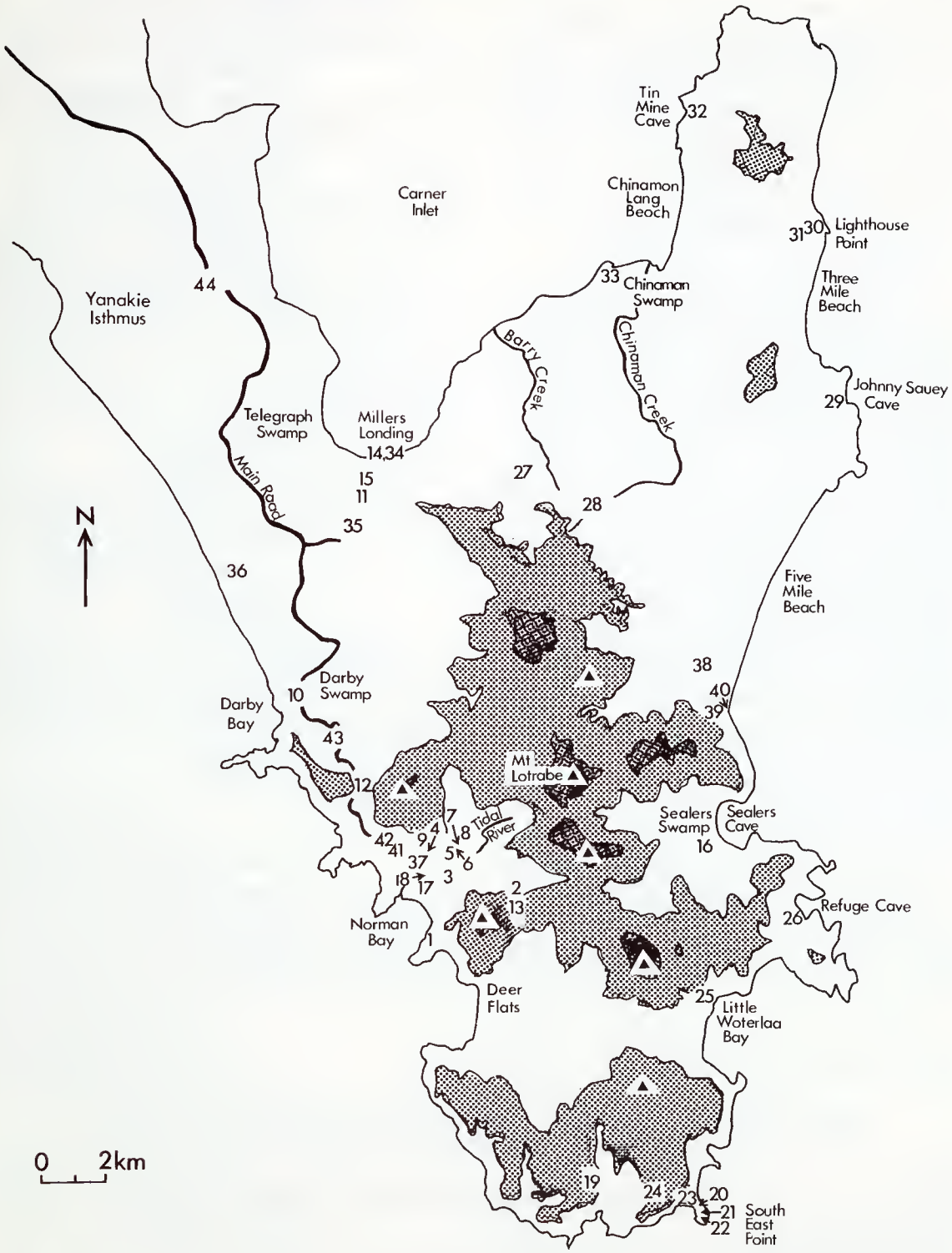
The vascular flora is well known, and a species list has been published by the National Parks Service (Anon., 1972a). Lower plants are less well known, but some information can be obtained from Garnet (1971), Ashton and Frankensberg (1976) and Ashton and Webb

Table 2. List of collecting sites at Wilsons Promontory with grid reference, vegetation type, locality and date. Sites are shown in Map B by the site numbers allocated in this table.

Site No.	Grid reference	Vegetation type	Locality	Date
1	414778	*Casuarina stricta*	Little Oberon Bay	
2	442792	Low eucalypt woodland	Telegraph Saddle	
3	422798	*Melalenca ericifolia* scrub	Waterpump shed	
4	416804	Closed heath	Lilly Pilly track	
5	423804	Closed scrub	" " "	
6	425805	*Pteridium esculentum*	" " "	
7	426807	Tall open forest	" " "	
8	427810	Closed forest	" " "	
9	415806	Low open forest	" " "	
10	372857	Coastal dune vegetation	Darby Beach track	
11	395920	*Banksia serrata*	Millers Landing track	
12	393826	Closed heath	Darby Ridge	12 Apr 1982
13	442789	*Banksia* sp.	S of Telegraph Saddle	3 Apr 1983
14	400933	*Melalenca ericifolia* scrub	Millers Landing, shore	
15	397926	Open heath	Millers Landing track	
16	502805	Closed forest	Sealers Cove track	23 Apr 1984
17	414793	*Leptospermum laevigatum*	Botany lab., Tidal River	
18	414796	*Banksia integrifolia*	Tidal River	30 Nov 1990
19	469699	Tall open forest	Roaring Meg Camping area	25 Apr 1989
20	502688	Closed heath	South East Point	26 Apr 1989
21	502687	*Casuarina stricta*	South East Point	26 Apr 1989
22	502686	Coastal vegetation	South East Point	26 Apr 1989
23	499689	*Banksia* scrub	Lighthouse lookout	26 Apr 1989
24	487694	Closed heath	Lighthouse track	26 Apr 1989
25	505756	*Acmena smithii*	Little Waterloo Bay	27 Apr 1989
26	536782	*Leptospermum laevigatum*	Refuge Cove	27 Apr 1989
27	448926	Open heath	Barry Creek	13 Apr 1990
28	468918	Closed forest	Chinaman Creek	
29	549949	Coastal vegetation	Johnny Souey Cove	14 Apr 1990
30	540005	*Banksia* woodland	Mt Margaret track	15 Apr 1990
31	536004	*Melalenca squarrosa* scrub	Mt Margaret track	15 Apr 1990
32	498042	Coastal vegetation	Tin Mine Cove	16 Apr 1990
33	473995	*Avicennia marina*	W of Chinaman Swamp	16 Apr 1990
34	402933	*Avicennia marina*	Millers Landing	17 Apr 1990
35	391910	Open scrub earpark	S of Millers Landing	17 Apr 1990
36	355897	*Leptospermum lanigerum*	Cotters Lake	18 Apr 1990
37	412802	Closed heath	Pillar Pt track	10 Apr 1982
38	503862	Closed forest	inland of Freshwater Lake	5 Apr 1991
39	510851	*Acmena smithii*	southern end, Five Mile Beach	6 Apr 1991
40	511851	Coastal vegetation	southern end, Five Mile Beach	6 Apr 1991
41	405804	Open heath	Turnoff to Squeaky Beach	7 Apr 1991
42	403808	Closed scrub	Beside main road	7 Apr 1991
43	386841	*Banksia serrata*	Beside main road	7 Apr 1991
44	346985	Coastal vegetation	Stockyard Camp	7 Apr 1991



Map A. Bass Strait, showing position of Wilsons Promontory in relation to the bathymetry and the Bass Strait islands. Submarine contours in fathoms.



Map B. Wilsons Promontory, showing collecting sites as numbered in Table 2. Contours are 200 m and 500 m.

(1977). The number of species of native and introduced vascular plants found in the park (up to July 1978) is shown in Table 1.

The structure of the vegetation is quite diverse. In general, forests are associated with the mountains of Palaeozoic granite. On the surrounding Quarternary sands trees are usually much shorter and more widely spaced or even absent, the plant communities in these areas being dominated by shrubs and herbs.

Sampling localities and methods

Originally eleven of the vegetation units (habitats) described by Smith (1978) were chosen for sampling on grounds of accessibility, the need to sample the widest possible range of habitats in the time available, and for comparison with habitats of a similar survey carried out by Smithers (1977) at Muogamarra Nature Reserve. These habitats (sites 1–11, Table 2, Map B) were systematically sampled over 13 months (22 Jan 1985–23 Feb 1986) on 18 occasions. On each occasion in each habitat ten samples were taken, each sample obtained by beating a branch of a tree or shrub 12 times. Where a number of plant species were present in a habitat, care was taken to ensure that all were sampled. From each of the remaining habitats (Table 2) 20 of these samples were taken once on the date shown, except those of sites 15, 17 and 28, which were sampled twice, and site 14 which was sampled on three occasions. Dislodged insects were aspirated from the beating tray (0.7 m^2) and preserved in 75% alcohol. Smith (1978) provides floristic information on all habitats sampled; the six-digit grid reference (Table 2) refers to the 1:50 000 Vicmap series of Wilsons Promontory. Sorting and specimen preparation involved standard techniques (New, 1977).

Checklist of Psocoptera from Wilsons Promontory National Park, Victoria

Lepidopsocidae

Echmepteryx (Loxopholia) albigena sp. nov.
E. (L.) renoides sp. nov.

Trogiidae

Cerobasis guestfalica (Kolbe, 1880)
Lepinotus reticulatus Enderlein, 1905

Caeciliidae

Caecilius concavistigma sp. nov.
C. ericifoliae sp. nov.
C. juneae sp. nov.
C. pteridii Smithers, 1977
C. quercus Edwards, 1950
C. semifuscatus (Tillyard, 1923)
C. wilsoni sp. nov.
Enderleinella hilli Smithers, 1979
E. selta sp. nov.

Amphipsocidae

Taeniostigma trickettae Smithers, 1974

Ectopsocidae

Ectopsocus acutistigma sp. nov.
E. australis sp. nov.
E. axillaris (Smithers, 1969)
E. briggsi McLachlan, 1899
E. californicus (Banks, 1903)
E. edwardsi New, 1973
E. pteridii Smithers, 1977
E. rileyae sp. nov.

Peripsocidae

Peripsocus bifasciatus sp. nov.
P. maoricus (Tillyard, 1923)
P. melaleucae New, 1971
P. milleri (Tillyard, 1923)
P. tillyardi New, 1973

Table 1. Number of native and introduced species of vascular plants recorded from Wilsons Promontory National Park by 1978 (Smith, 1978)

Group	Native	Introduced	Total
Ferns and fern allies	60	-	60
Flowering plants			
Monoeotyledons	248	35	283
Dicotyledons	433	82	515
Total	741	117	858

Pseudocaeciliidae

Austropsocus antennalis Thornton and New, 1977
A. cornutus sp. nov.
A. costalis Thornton and New, 1977
A. hyalinus Thornton, Wong and Smithers, 1977
A. sinuosus (Banks, 1939)
A. tibialis Thornton and New, 1977
A. viridis (Enderlein, 1903)
Cladioneura pulchripennis Enderlein, 1906
Heterocaecilius brunellus (Tillyard, 1923)
H. lachlani (Enderlein, 1903)
Pseudoscottiella papillosa sp. nov.
P. rotundata New, 1974
P. tanei Smithers, 1977
P. yenoides sp. nov.

Philotarsidae

Aaroniella rawlingsi Smithers, 1969
Haplophallus sinus Thornton and New, 1977
Latrobiella fenestrata sp. nov.
L. guttata (Tillyard, 1923)

Elipsocidae

Drymopsocus brunneus Smithers, 1963
Pentacladus eucalypti Enderlein, 1906
Propsocus pulchripennis (Perkins, 1899)
Spilopsocus masseyi New, 1971
S. serratus sp. nov.

Psocidae

Blaste bistriata sp. nov.
B. forficula sp. nov.
B. lignicola (Enderlein, 1906)
B. taylori New, 1974
B. tillyardi Smithers, 1969
Clematostigma lunulata sp. nov.
C. maculiceps (Enderlein, 1903)
C. striata sp. nov.
Ptycta australis sp. nov.
P. campbelli sp. nov.
P. glossoptera New, 1974
P. muogamarra Smithers, 1977
P. prosta sp. nov.
P. umbrata New, 1974
Sigmatoneura formosa (Banks, 1918)
Tanystigma inglewoodense (New, 1974)
T. valvula sp. nov.

Myopsocidae

Myopsocus australis (Brauer, 1865)

Systematics

In the following systematic treatment drawings from permanent preparations were made with the aid of a camera lucida by Ms J. Browning. Measurements of body parts are given in mm, and the method used for determining the ratio of interocular distance to diameter of eye (IO:D in systematic treatment below) was that of Pearman, as described by Ball (1943). The following abbreviations are used: B, body length; ct, number of ctenidia on hind tarsal segments; F, length of hind femur; f_1, length of basal flagellar segment; f_2, length of second flagellar segment; FW, length of fore wing; HW, length of hind wing; T, length of hind tibia; t_1, t_2, t_3, length of basal, second and apical tarsal segments respectively; rt, ration of t_1 and t_3 to t_2. Localities are enumerated in Table 2. Holotypes, allotypes and paratypes are deposited in the Australian Museum, Sydney. Remaining material is either deposited in the Museum of Victoria or retained in the authors' collections.

Lepidopsocidae Pearman

Echmepteryx Aaron

Echmepteryx Aaron, 1886: 17. Type species: *Amphientomum hageni* Packard.

Echmepteryx (Loxopholia) Enderlein

Loxopholia Enderlein, 1931: 225. Type species: *Loxopholia pinnula* Enderlein = *Echmepteryx (Loxopholia) pinnula*. — Roesler, 1944: 133.

Remarks. Since only six species of *Echmepteryx (Loxopholia)* Enderlein are known from Australia we provide a key to the Australian species.

Key to Australian species of *Echmepteryx (Loxopholia)* Enderlein

1. Ocelli present 2
— Ocelli absent ..... *E. howensis* Smithers and Thornton
2. Fore wing apically spear-shaped (in hind wing vein r_1 arising distal to vein m_1) 3
— Fore wing shape normal (in hind wing vein m_1 opposite or arising distal to vein r_1) 5

3. Fore wing with brown membrane and a hyaline fascia in apical third 4
— Fore wing barely tinged pale brown, no fascia *E. hartmeyeri* Enderlein
4. Gena pale cream posteriorly, large basal brown cloud in fore wing having small hyaline areas ..... *E. albigena* sp. nov.
— Gena dark brown, large basal brown cloud in fore wing lacking hyaline areas ..... *E. quadrilineata* Smithers
5. Epicranial suture distinct, dark brown; coxa, femur of legs dark brown; fore wing membrane brown except for colourless apex, venation distinct ..... *E. brunnea* Smithers
— Epicranial suture not distinct; coxa, femur of legs pale cream; fore wing membrane with brown and hyaline areas, venation not distinct ..... *E. renoides* sp. nov.

Echmepteryx (Loxopholia) albigena sp. nov.

Figures 1–9

Material examined. Holotype ♂ : Refuge Cove, *Leptospermum laevigatum*, 27 Apr 1989. Allotype ♀, 2♂ and 1♀ paratypes: same data as holotype (K73372–K73376). Additional records (2♀, 1 nymph): site 19, site 28 (Apr 1990).

Description of male. Coloration (after ca 1 yr in alcohol). Head cream with brown markings as in fig. 1. Maxillary palps pale cream, distal half of apical segment grey-brown. Genae posteriorly pale cream. Scape and pedicel grey-brown, antennae brown. Fore wing (fig. 2) membrane brown with paler markings, veins in various shades of brown. Hind wing (fig. 3) hyaline, veins brown. Prothorax pale. Mesothoracic nota pale brown, pale buff anterolaterally. Metathorax pale buff, brown medially. Thoracic pleura cream with longitudinal grey-brown narrow line. Legs with coxa, trochanter and femur cream, femur brown apically; tibia brown with narrow buff band basally, broader buff bands apically and at mid-length; basal tarsal segment brown over basal third, otherwise creamy buff, second segment pale brown, apical segment pale buff. Abdomen cream, with brown terminal structures.

Morphology. IO:D = 2.2. Antennae complete, with 38 flagellar segments. Stout brown setae on brown stripes on vertex, on lateral areas of frons and on anterior edges of genae. 3 ocelli, anterior ocellus slightly smaller than lateral ocelli. Fore wing with asymmetrical scales on membrane, marginal scales narrow. Both fore and hind wings (figs 2, 3) spear-shaped apically, similar to *Echmepteryx (Loxopholia) quadrilineata* Smithers. In hind wing vein r_{2+3} 3 times, r_{4+5} 5.3 times, length of stalk of radial fork. Rasp of Pearman's organ well developed. Basal hind tarsal segment with 15 etenidia. Claw with stout subapical tooth, pulvillus narrow. Epiproct (fig. 4) simple, setose. Paraproct (fig. 4) with field of 6 trichobothria and 1 seta without a basal rosette; posterior spine blunt. Hypandrium (fig. 5) semicircular, setose. Phallosome (fig. 6).

Dimensions. B 2.5, FW 2.54, HW 1.92, F 0.88, T 1.15, t_1 0.480, t_2 0.080, t_3 0.080, rt 6.0:1:1.0, f_1 0.059, f_2 0.055, f_1/f_2 1.07.

Description of female. Coloration (after ca 1 yr in alcohol). As male.

Morphology. IO:D = 2.2. General morphology similar to that of male. Epicranial and frons-vertex sutures more clearly discernible than in male. In hind wing vein r_{2+3} 2.7–5.5 times, vein r_{4+5} 5–9 times, length of stalk of radial fork. Epiproct (fig. 7). Paraproct (fig. 7) with 7 (and 6) setae in basal rosettes and 1 seta without a rosette; field of setae on mesial surface with 2 setae at least twice as long as remaining 18; posterior spine blunt. Subgenital plate (fig. 8). Gonapophyses (fig. 9).

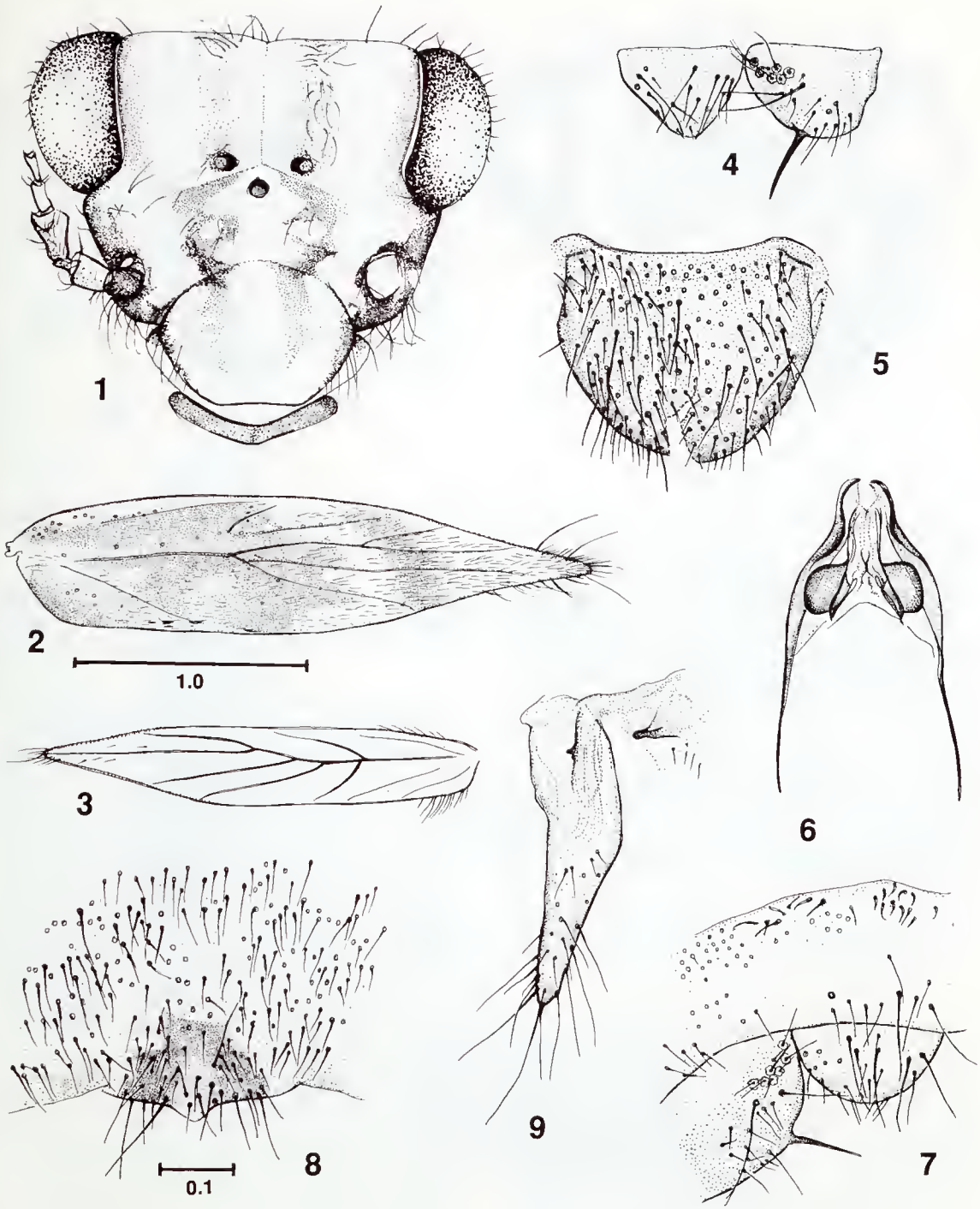
Dimensions. B 2.8, FW 2.48, HW 1.95, F 0.92, T 1.15, t_1 0.513, t_2 0.166, t_3 0.158, rt 3.1:1:1.1, f_1 0.059, f_2 0.047, f_1/f_2 1.25.

Remarks. This species resembles *Echmepteryx quadrilineata* in details of pattern of brown pigment on the fore wing membrane and in head pattern. *E. quadrilineata*, however, lacks the small hyaline areas within the large basal brown cloud in the fore wing, and has dark brown genae. The head pattern is very similar to the typical form of *Lepidopsocus fasciatus* Thornton, which, however, is clearly a member of the genus *Lepidopsocus* Enderlein on wing venation.

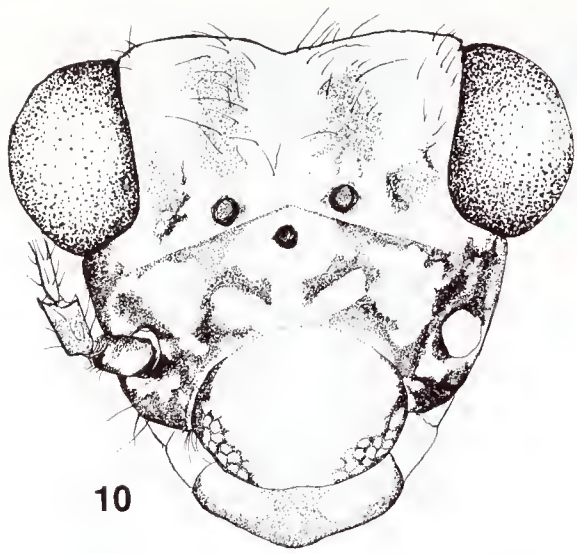
Echmepteryx (Loxopholia) renoides sp. nov.

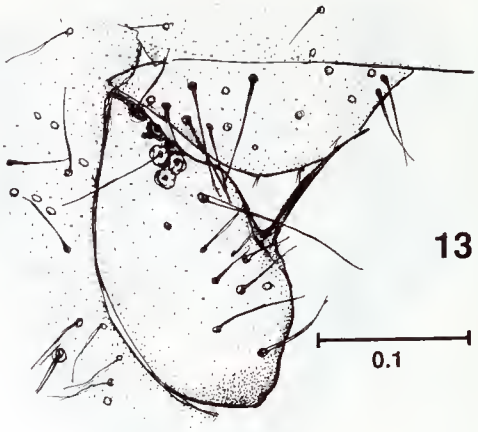
Figures 10–17

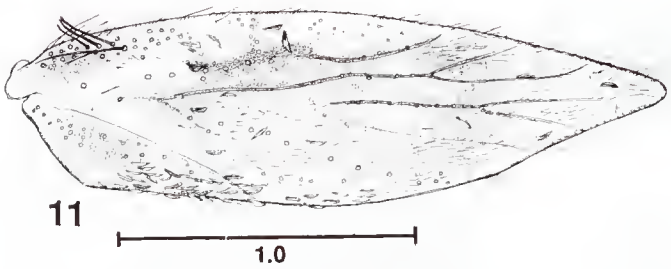
Material examined. Holotype ♀: Darby Beach Track, coastal dune vegetation, 23–26 Jun 1985. Allotype ♂, 2 nymphs, 3♀ and 1♂ paratypes: same data as holotype (K73377–K73382). Additional records (46♀, 7♂, 56 nymphs): site 1 (May 1985, Jan 1986), site 10

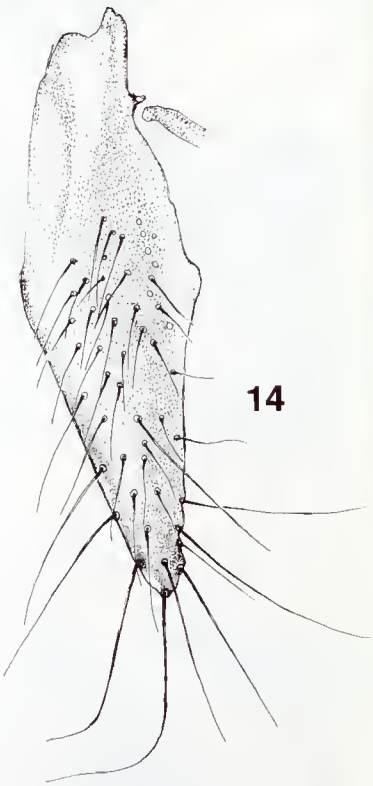


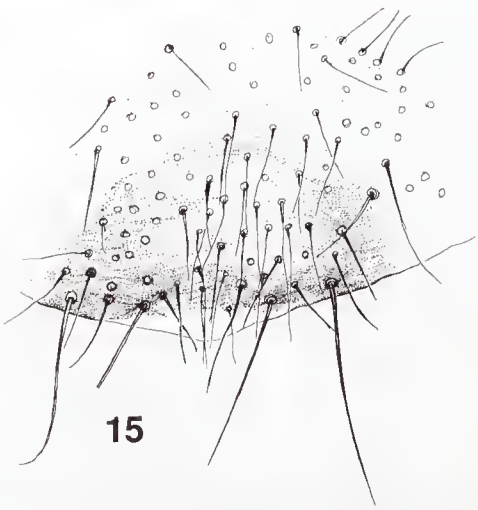
Figures 1–9. *Echmepteryx albigena*. Male: 1, head; 2, forewing; 3, hindwing; 4, epiproct and paraproct; 5, hypandrium; 6, phallosome. Female: 7, epiproct and paraproct; 8, subgenital plate; 9, gonapophyses. Figure 1 not to scale. Figures 2, 3 and 4–9 to common scales.



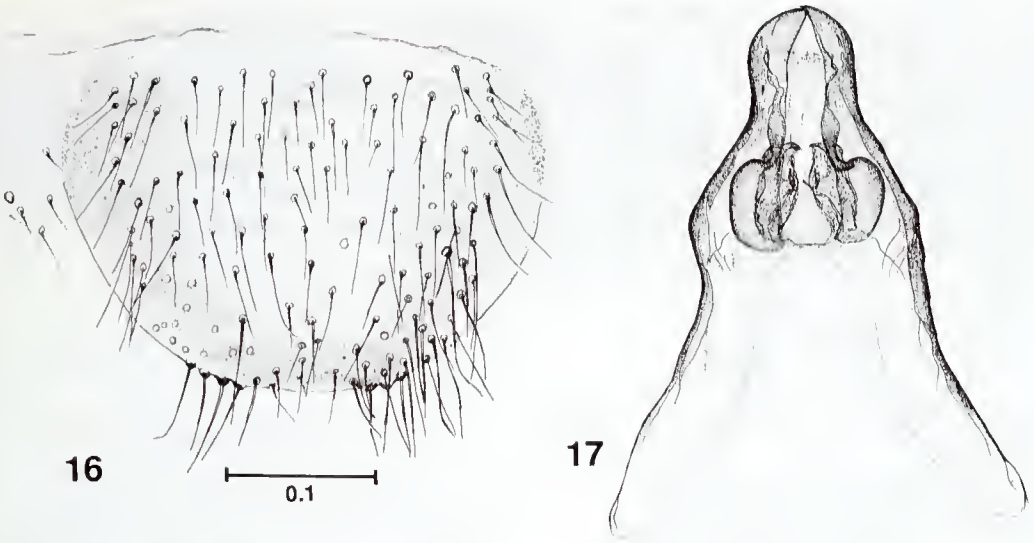








Figures 10–15. *Echmepteryx renoides*. Female: 10, head; 11, forewing; 12, hindwing; 13, epiproct and paraproct; 14, gonapophyses; 15, subgenital plate. Figure 10 not to scale. Figures 11, 12 and 13–15 to common scales.



Figures 16–17. *Echmepteryx renoides*. Male: 16, hypandrium; 17, phallosome. Figures 16 and 17 to common scale.

(Apr, May, Jul, Aug, Sep, Oct, Nov, Dec 1985, Jan, Feb 1986), site 12, site 14 (Apr 1984, Apr 1990 – nymph only, Jan 1991), site 17 (Jan 1985, Dec 1990), site 44.

Description of female. Coloration. (after ca 5 yr in alcohol). Head pale buff with distinct markings (fig. 10); brown mark from orbit fuses with brown area surrounding base of antenna; gena with dark band below antennal socket parallel to antennal-orbital band; labrum dark grey in distal half, white in basal half, a dark grey median band from distal grey area to base of labrum. Antennae light brown, eyes black. Maxillary palps very pale buff, apical and subapical segments pale grey-brown. Mesonotum brown, thoracic pleura with brown band running above coxae. Legs: coxa, trochanter and femur pale cream, femur with apical brown patch on lateral face and a smaller subapical black patch on both faces, continuing over ventral surface; tibia buff with broad basal and subapical bands; basal tarsal segment brown basally fading to buff quarter along length, other segments buff. Fore wing membrane (fig. 11) with brown and hyaline areas, macrosetae on veins brown; hind wing (fig. 12) hyaline, veins brown. Abdomen pale whitish-cream, tergites with grey marks along anterior edges laterally, sterna grey-brown laterally, abdomen from beneath thus appearing to have the broad lateral bands enclosing a whitish-cream area.

Morphology. IO:D = 2.5. Head with long strong setae, grouped particularly on pigmented areas and posterior to brown vertex marks. Flagellum with 38 segments. Setae on fore wing veins 4 times length and ca 10 times thickness of membrane setae, scales asymmetrical; macrosetae on veins and apical marginal setae with short sharp spinelets on one side over apical quarter. Epiproct (fig. 13) triangular, setose; paraproct (fig. 13) with trichobothrial field of 6 setae in rosette sockets and 1 without such a socket; mesial spine long, slightly curved, sharp. Gonapophyses (fig. 14). Subgenital plate (fig. 15).

Dimensions. B 2.4, FW 2.15, HW 1.62, F 0.67, T 1.06, t_1 0.434, t_2 0.103, t_3 0.079, rt 4.2:1:1.3, f_1 0.055, f_2 0.036, f_1/f_2 1.55.

Description of male. Coloration (after ca 5 yr in alcohol). As female.

Morphology. IO:D = 2.5. General morphology similar to that of female. Epiproct semicircular, setose; paraprocts as for female. Hypandrium (fig. 16). Phallosome (fig. 17), parameres divergent, meeting apically, a prominent pair of kidney-shaped sclerites within parameres.

Dimensions. B 2.1, FW 2.27, HW damaged, F 0.71, T 1.00, t_1 0.419, t_2 0.103, t_3 0.079, rt 4.1:1:1.3, f_1 0.047, f_2 0.039, f_1/f_2 1.20.

Description of nymph. Coloration (after ca 5 yr in alcohol). Head pattern as adult, slightly simplified, thorax dorsally with 2 longitudinal grey-

brown bands extending to first abdominal tergite where they widen slightly.

Remarks. This species generally resembles *Echmepteryx (Thylacopsis) picta* Smithers from New South Wales. It was found predominantly on coastal dune vegetation (site 10) and also occurred on *Casuarina* (site 1), *Melaleuca* (site 14) and *Leptospermum* (site 17). The two species can easily be separated on details of hind wing venation.

Trogiidae Enderlein

Cerobasis Kolbe

Cerobasis Kolbe, 1882: 212. Type species: *Cerobasis muraria* Kolbe.

Cerobasis guestfalicus (Kolbe)

Hyperetes guestfalicus Kolbe, 1880: 132.
Cerobasis guestfalicus. — Roesler, 1943: 13.

Material examined. 328♀, 46 nymphs: site 1 (Feb, Mar, May, June, July, Aug, Sep, Oct, Nov, Dec 1985, Jan 86), site 3 (Feb, Apr 1985), site 4 (Feb, May, Jul 1985, Jan 1986), site 10 (Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec 1985, Jan, Feb 1986), site 11 (Feb, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec 1985, Jan, Feb 1986), site 12, site 17 (Dec 1990), site 20 – nymph only, site 26, site 29, site 36, site 41.

Remarks. This cosmopolitan species has been recorded previously from South Australia, Victoria and Curtis Island. It was collected at Wilsons Promontory predominantly from coastal dune vegetation (site 10) and coastal *Casuarina stricta* (site 1), as well as from *Banksia serrata* (site 11).

Lepinotus Heyden

Lepinotus Heyden, 1850: 84. Type species: *Lepinotus inquilinus* Heyden.

Lepinotus reticulatus Enderlein

Lepinotus reticulatus Enderlein, 1905: 31.

Material examined. 15♀: site 6 (May 1985), site 10 (May, Nov 1985, Feb 1986), site 11 (Apr, May, Jun 1985), site 26, site 32, site 40.
Remarks. Collected on bracken (site 6), *Banksia serrata* (site 11), and coastal dune and heath vegetation, this cosmopolitan domestic species has been recorded from Curtis Island and South Australia.

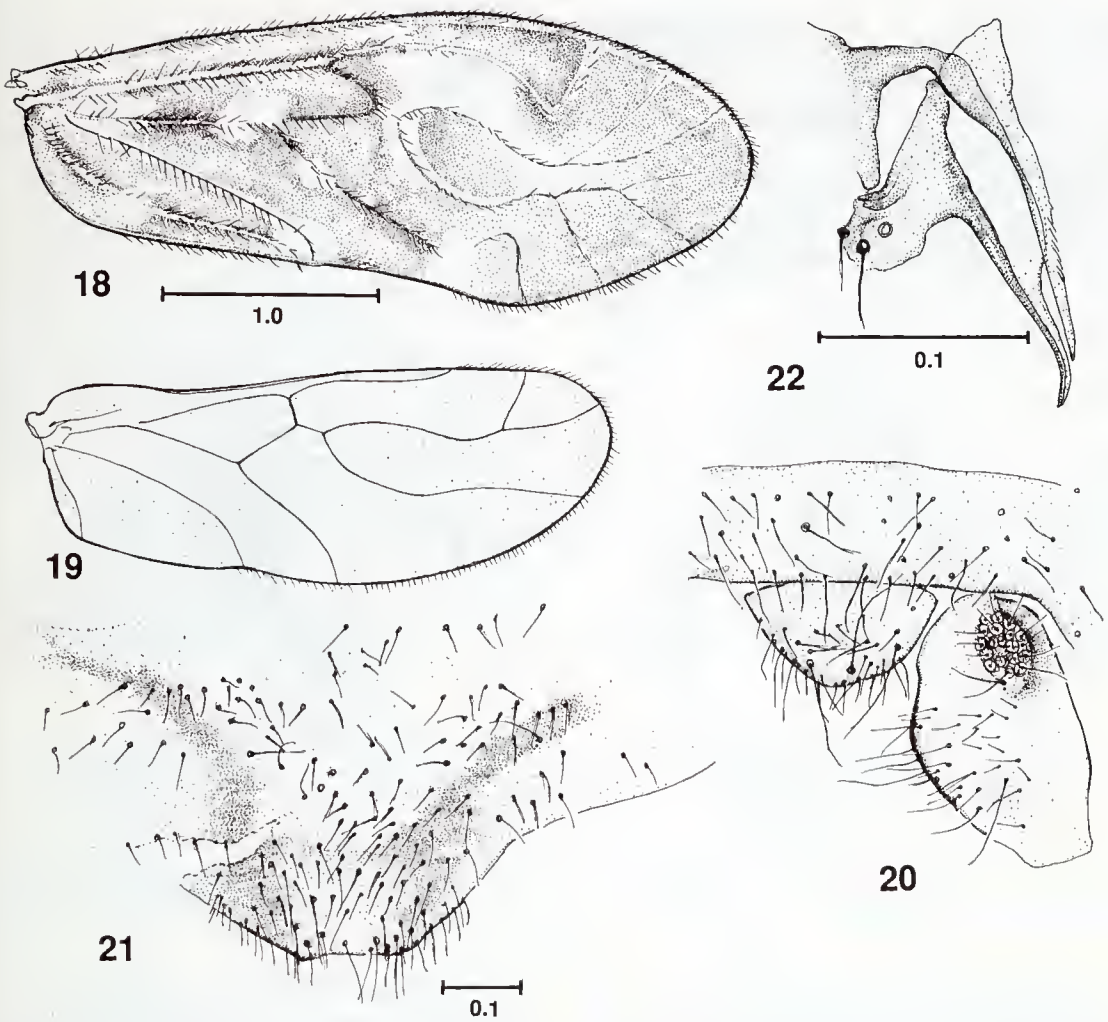
Caeciliidae Pearman

Caecilius Curtis

Caecilius Curtis, 1837: 648. Type species: *Psocus fuscopterus* Latreille.

Key to species of *Caecilius* from Wilsons Promontory

1. Fore wing pale, yellowish, uniform, sometimes cell 1A darker than rest of membrane 2
— Fore wing with blotched or clear-cut pattern 4
2. Fore wing with vein cu_2 glabrous, cell 1A darker than rest of membrane 3
— Fore wing with vein cu_2 setose, cell 1A not darker than rest of membrane ..... *C. ericifoliae* sp. nov.
3. A dark mark between eye and epistomial suture . *C. pteridii* Smithers
— No dark mark between eye and epistomial suture *C. quercus* Edwards
4. Postclypeus with distinct striae, maxillary palp dark brown 5
— Postclypeus uniform brown, lacking distinct striae, maxillary palp pale brown 6
5. Fore wing with 3 hyaline areas in angles at bifurcation of vein *m* + *cu* ..... *C. semifuscatus* (Tillyard)
— Fore wing lacking hyaline areas in angles at bifurcation of vein *m* + *cu* ..... *C. wilsoni* sp. nov.
6. Head pattern with dark X-mark centred on ocellar protuberance, fore wing with pterostigmal spur vein ..... *C. juneae* sp. nov.
— Head pattern lacking dark X-mark centred on ocellar protuberance, fore wing lacking pterostigmal spurvein ..... *C. concavistigma* sp. nov.



Figures 18–22. *Caecilius concavistigma*. Female: 18,forewing; 19,hindwing; 20,epiproct and paraproct; 21,subgenital plate; 22, gonapophyses. Figures 18, 19 and 20–22 to common scales.

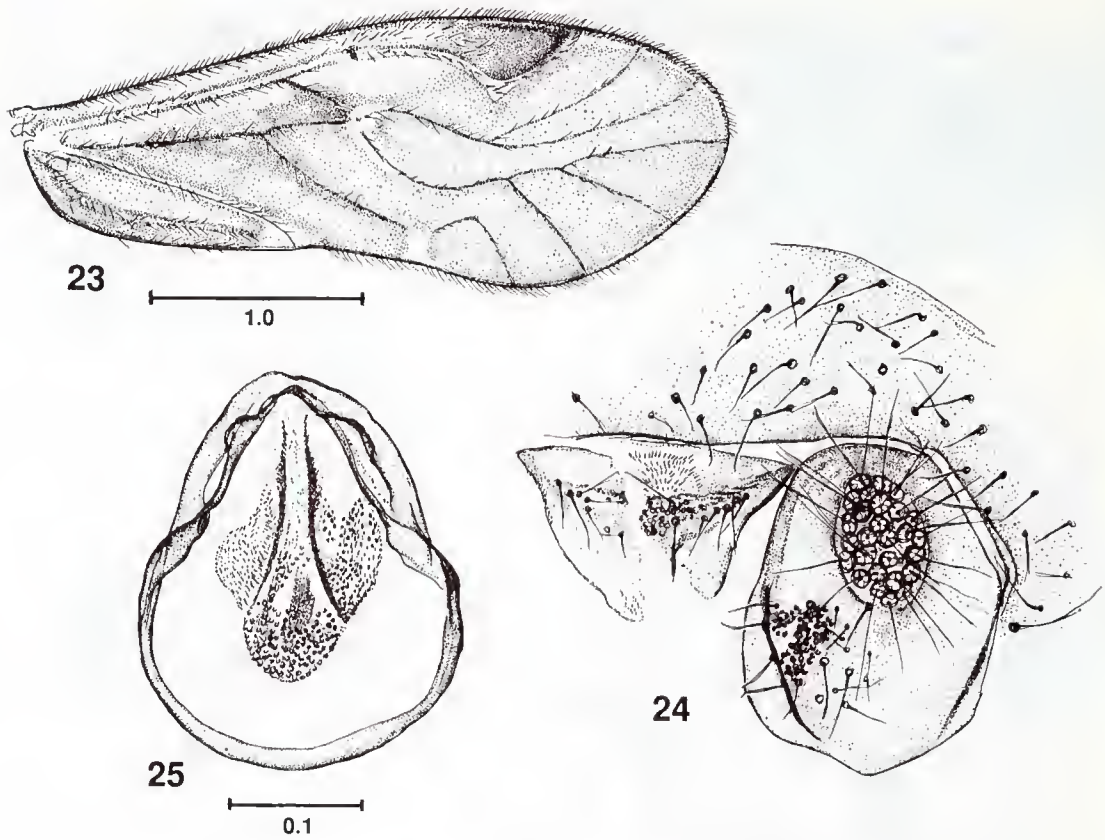
Caecilius concavistigma sp. nov.

Figures 18–25

Material examined. Holotype ♀: Lilly Pilly Nature Track, tall open forest, 20–21 Nov 1985; allotype ♂: same data as holotype; 2 nymphs, 2♀ and 1♂ paratypes: Little Waterloo Bay, *Acmena smithii*, 27 Apr 1989 (K73383–K733987). Additional records (2♀, 1♂, 2 nymphs): site 7 (Feb 1986 – nymph only), site 14 (Jan 1991), site 18, site 19.

Description of female. Coloration (after ca 6 yr in alcohol). Head buff with following very pale brown: markings dorsal and behind orbit; indistinct striae on postelypeus; scape, pedicel and first three flagellar segments. Remaining flagellar segments, tip of apical segment of maxillary palp and labrum brown. Eyes blaek. Ocelli pale, inner margins dark brown. Dorsa and sides of thorax brown, sutural areas paler. Legs buff, except dorsal half of eoxa and apieal tarsal segment brown; claws black. Fore wing (fig. 18) with hyaline and pigmented areas. Hind wing (fig. 19) faintly tinged brown. Abdominal segments dorsally mauve (faded in holotype), paler ventrally.

Morphology. IO:D = 5.0. Clypeal shelf intermediate. Labral stylets small, spiculate; labral sensillae 5 in all; internal labral sclerotization present.



Figures 23–25. *Caecilius concavistigma*. Male: 23, forewing; 24, epiproct and paraproct; 25, phallosome. Figures 24 and 25 to common scale.

Lacinia broad, flat, expanded preapically on 1 side, with apical denticles. Fore wing with basal section of pterostigma strongly concave, vertex sharply angled; areola postica trianguloid; vein cu_2 strongly setose; veins *m + cu, r, an* and the basal section of cu_1 with setae in 2 ranks, setae of remaining veins in single rank. Mesothoracic precoxal suture absent. Epiproct (fig. 20) bearing 3 large preapical setae, semicircular, setose. Paraproct (fig. 20) with oval field of 21 trichobothria, 1 seta not in rosette; inner margin sclerotised. Subgenital plate (fig. 21) apically lightly sclerotised, with V-shaped sclerotisation basally; lateral apical margins with small, very shallow apophyses; setose. Gonapophyses (fig. 22).

Dimensions. B 3.2, FW 3.36, HW 2.60, F 0.71, T 1.12, t_1 0.326, t_2 0.134, rt 2.4:1, ct 0, 0, f_1 0.614, f_2 0.384.

Description of male. Coloration (after ca 6 yr in alcohol). As female, with following exceptions: head and antenna brown; epicranial suture dark brown; tibia and basal tarsal segment pale brown; fore wing (fig. 23) more uniformly pigmented brown than that of female, hyaline patches reduced; abdomen cream, terminal segments brown.

Morphology. IO:D = 1.65. Clypeus, labrum and lacinia as in female. Ocelli on slightly raised tubercle. Epicranial suture not reaching ocelli. Basal flagellar segment not enlarged, slightly bent. Basal section of pterostigma less concave than that of female, angle of vertex less acute. Setae on fore wing veins distributed as in female. Mesothoracic precoxal suture as in female. Tibiae of uniform width, swellings absent. Epiproct (fig. 24, damaged) bearing 2 large preapical setae in surrounding rugose field, line of setae each side of field; broad, shallow. Paraproct (fig. 24) with oval field of 28 trichobothria, 2 setae not in rosettes; near sclerotised inner margin a rugose field with associated setae. Hypandrium

simple, setose; longer setae on posterolateral margins. Phallosome (fig. 25).

Dimensions. B 2.4, FW 3.27, HW 2.51, F 0.68, T 1.15, t_1 0.348, t_2 0.142, rt 2.4:1, et 23, 0, f_1 0.624, f_2 0.432.

Remarks. This is a species of tall open forest. In fore wing pattern *C. concavistigma* is similar to *Caecilius juneae* (below) and *Caecilius macrostigma* Enderlein. Vein cu_2 of the fore wing is heavily setose in these species (described as the *analis* vein for *C. macrostigma* by Enderlein, 1903: 272 and fig. 4). *C. concavistigma* may be distinguished from *C. macrostigma* by the latter's very broad pterostigma, and it differs from *C. juneae* in details of head pattern and in lacking a pterostigmal spur vein on the fore wing.

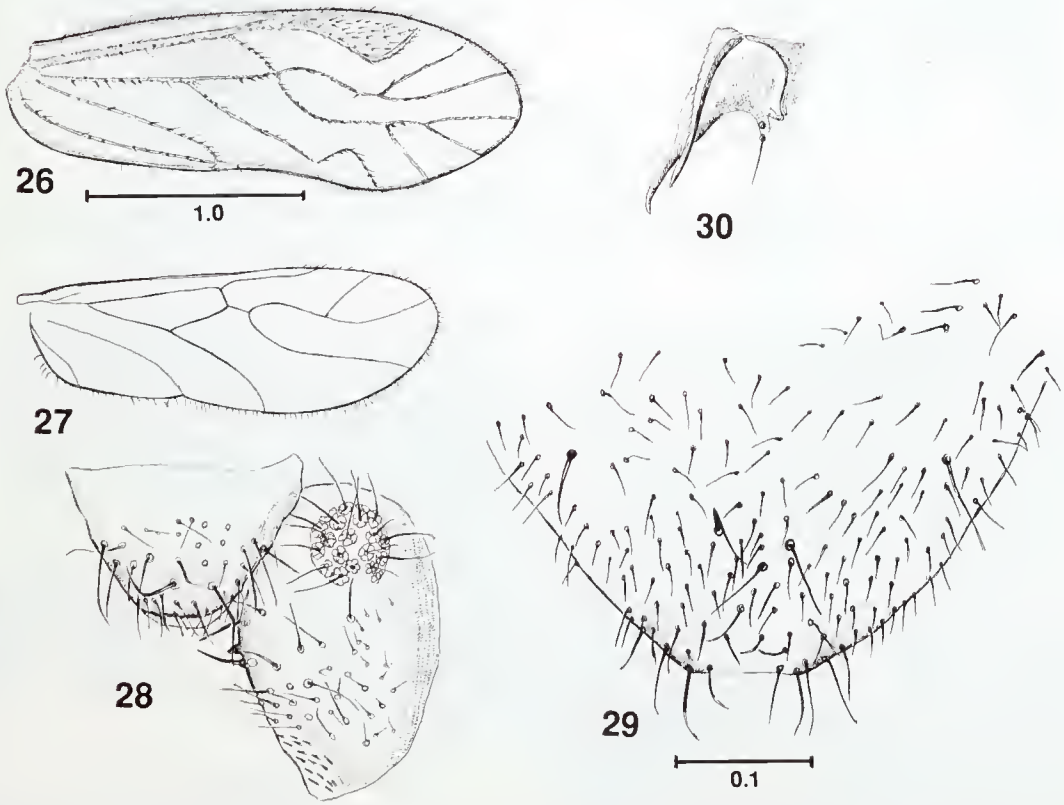
Caecilius ericifoliae sp. nov.

Figures 26–35

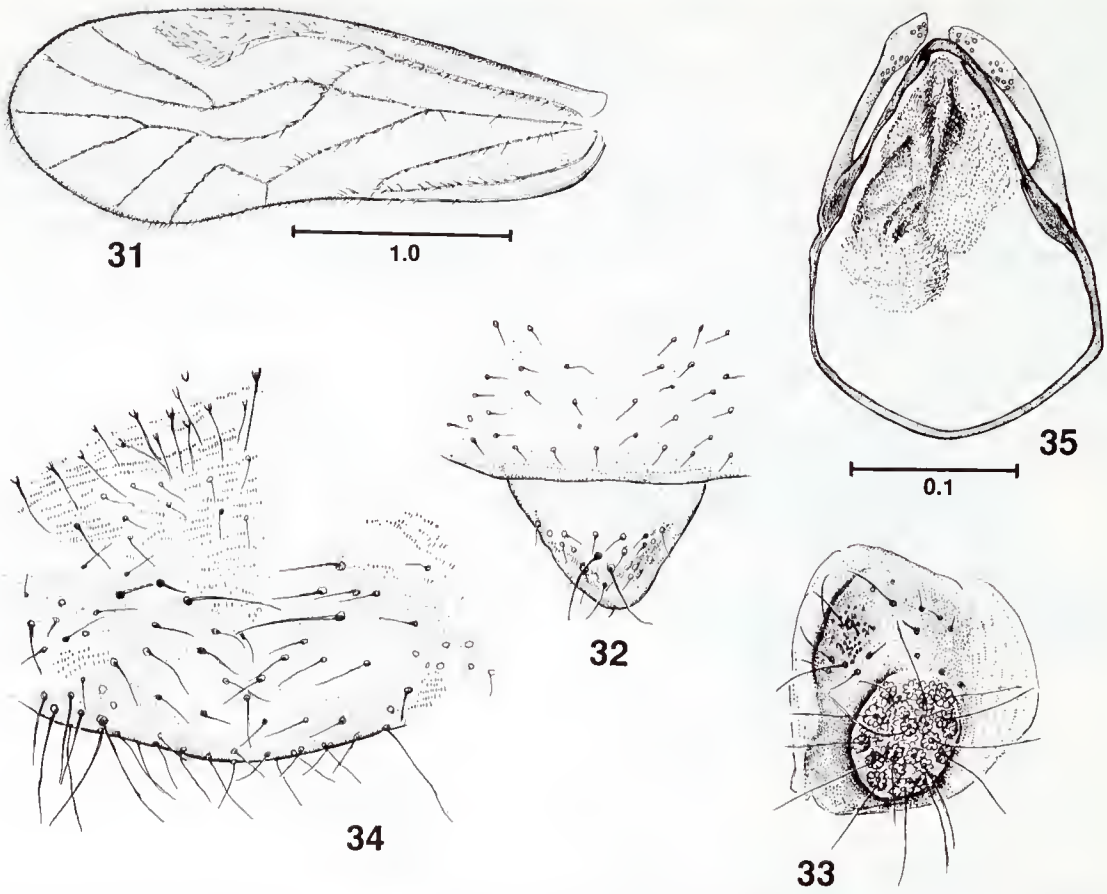
Material examined. Holotype ♀: Waterpump shed, *Melaleuca ericifolia* scrub, 5–6 Jan 1986; allotype ♂, same locality as holotype, 21–23 Apr 1985; 5 nymphs, 31♀ and 20♂ paratypes: same data as holotype (K73388–K73440). Additional records (89♀, 76♂, 15 nymphs): site 3 (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec 1985, Jan, Feb 1986), site 14 (Apr 1984, Apr 1990), site 21, site 23.

Description of female. Coloration (after ca 5 yr in alcohol). Whole insect pale yellowish-buff with following exceptions: eyes and inner border of ocelli black; faint brown patches of pigment mesad of orbit and each side of epicranial suture; distal end of apical segment of maxillary palp brown; scape, pedicel and flagellar segments 3 to 11 brown; claw and distal two-thirds of apical tarsal segment brown.

Morphology. IO:D = 10, eyes small. Clypeal shelf intermediate. Labral stylets small, spiculate; labral sensillae 5 in all; internal labral sclerotization absent. Lacinia broad, flat, expanded preapically on 1 side, with apical denticles. Pterostigma of fore wing (fig. 26) with prominent posterior angle, vein cu_2 setose. Mesothoracic precoxal suture absent. Hind wing (fig.



Figures 26–30. *Caecilius ericifoliae.* Female: 26, forewing; 27, hindwing; 28, epiproct and paraproct; 29, subgenital plate; 30, gonapophyses. Figures 26, 27 and 28–30 to common scales.



Figures 31–35. *Caecilius ericifoliae*. Male: 31, forewing; 32, epiproct; 33, paraproct; 34, hypandrium; 35, phallosome. Figures 32–35 to common scale.

27). Epiproct (fig. 28) trapezoid, setose, a pair of prominent setae some distance from posterior margin. Paraproct (fig. 28) with a circular field of 19 trichobothria and 1 seta not in a rosette. Subgenital plate (fig. 29) setose, with short straight posterior margin, slightly sclerotised at posterior angles. Gonapophyses (fig. 30).

Dimensions. B 2.0, FW 2.33, HW 1.89, F 0.52, T 0.81, t_1 0.240, t_2 0.135, rt 1.8:1, ct 19, 0, f_1 0.387, f_2 0.288.

Description of male. Coloration (after ca 5 yr in alcohol). As female.

Morphology. IO:D = 5.5. Clypeus, labrum and lacinia as in female. Basal flagellar segment not enlarged or bent. Fore wing (fig. 31) as female but larger. Mesothoracic precoxal suture as in female. Tibiae of uniform width, swellings absent. Epiproct (fig. 32) trianguloid, pair of very long setae some distance from posterior margin. Paraproct (fig. 33) with field of 20 trichobothria and 1 seta not in rosette; spiculate field posteriorly near mesial margin. Hypandrium (fig. 34) simple, posterior margin slightly sinuous and somewhat sclerotised. Phallosome (fig. 35) with large lobed spiculate penial bulb.

Dimensions. B 1.7, FW 2.71, HW 2.18, F 0.52, T = 0.87, t_1 0.260, t_2 0.125, rt 2.1:1, ct 19, 0, f_1 0.474, f_2 0.347.

Remarks. This species was taken predominantly on *Melaleuca ericifolia* (sites 3, 14). It is similar to *Caecilius flavistigma* Tillyard from New Zealand, which also has vein cu_2 of the fore wing setose. In *C. flavistigma*, however, the anal cell of the fore wing is fuscous.

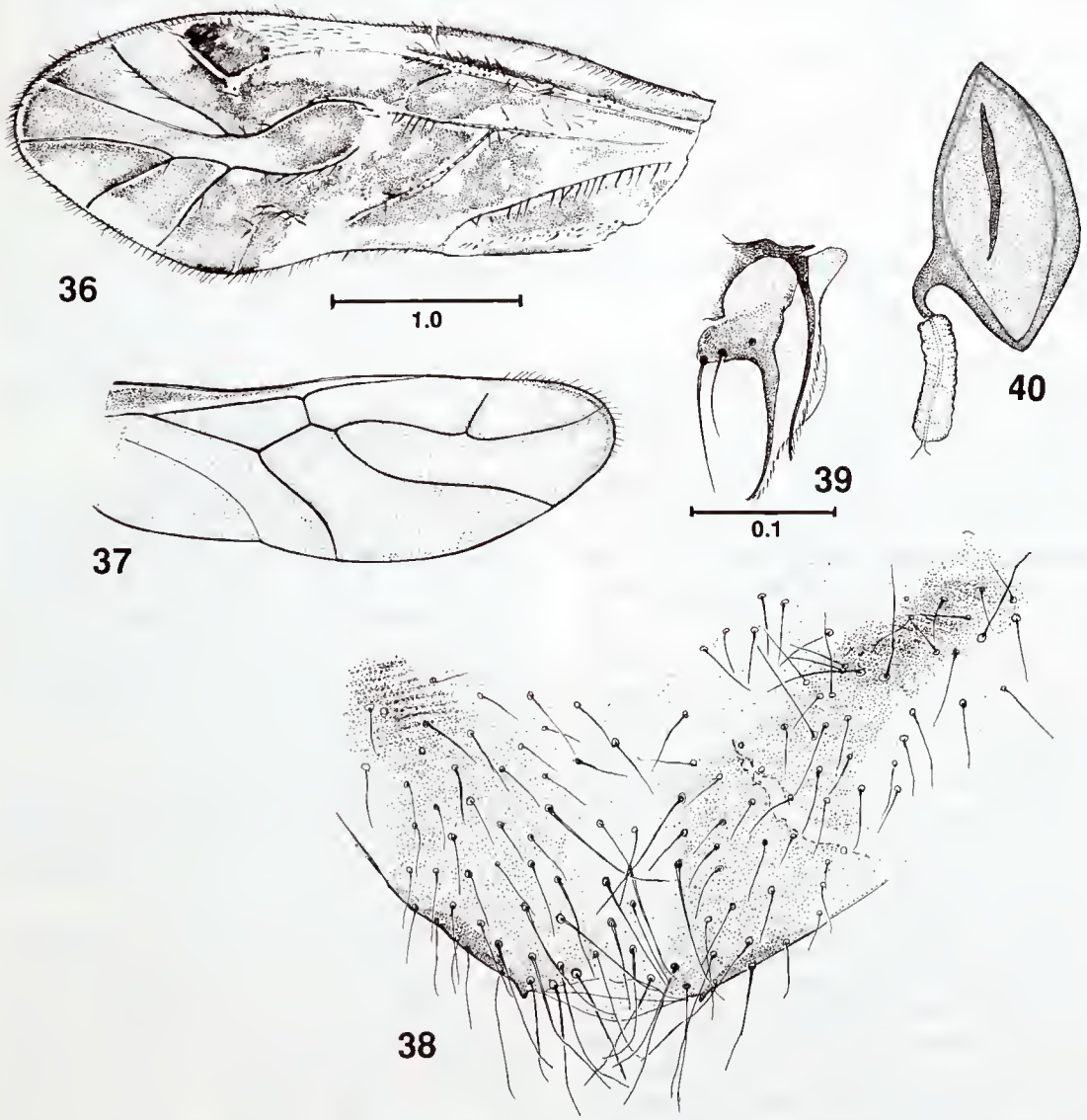
Caecilius juneae sp. nov.

Figures 36–43

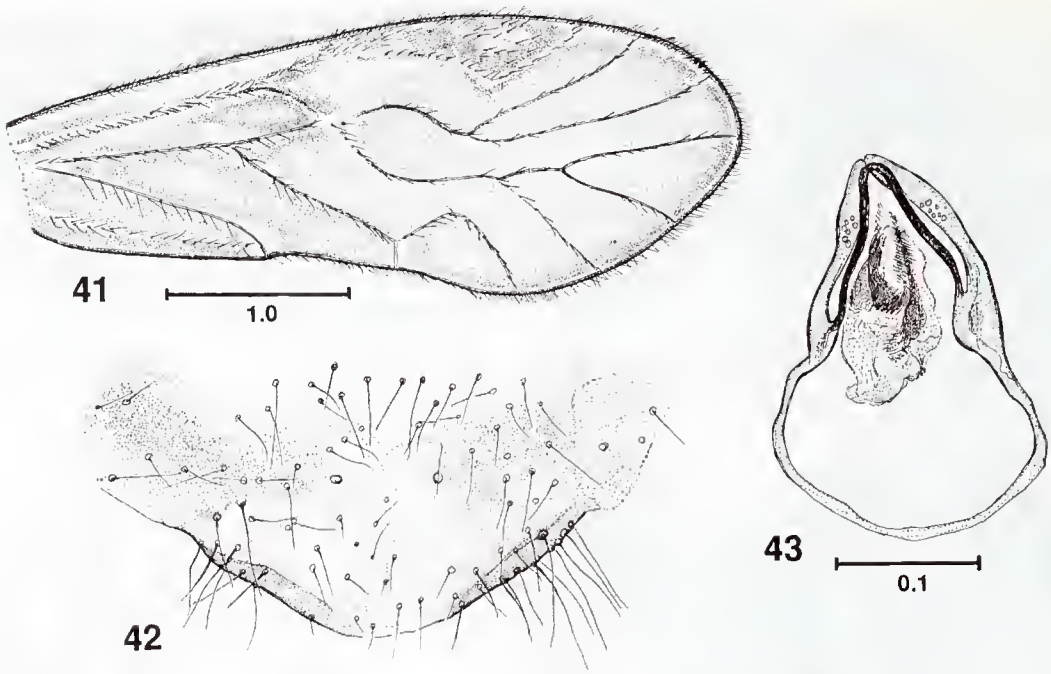
Material examined. Holotype ♀: 'The Loop', Lilly Pilly Nature Track, closed forest, 12–15 Mar 1985. Allotype

♂, 1♀ and 1♂ paratypes: same locality as holotype, 29 Sep–1 Oct 1985 (K73441–K73444). Additional records (10♀, 11♂, 10 nymphs): site 7 (Nov 1985 – nymph only, Jan, Feb 1986), site 8 (Nov, Dec 1985, Jan 1986, Jan 1991) site 19, site 25, site 28 (Apr 1990), site 42.

Description of female. Coloration (after ca 5 yr in alcohol). Head: ground color buff with the following brown: a band along posterior margin of vertex each side of but not reaching epicranial suture; a brown cloud each side of epicranial suture in middle of vertex; fused pigment patches mesad of orbits; stirrup mark in middle of frons; postclypeus; labrum. The following markings are dark grey-black: ocellar protuberance, each side of this and more posteriorly a cloud larger than protuberance and connected to it by a narrow band; a band from protuberance to antennal socket along anterior margin of vertex, from socket to orbit, and posterior of orbit over posterior angle of vertex. Eyes black. Apical segment of maxillary palp grey. Prothoracic pleura dark grey-brown, meso-thoracic antedorsum brown, paler laterally and posteriorly, dorsa grey-brown over anterior half, brown posteriorly, area between dorsa cream. Scutellum brown; metathoracic antedorsum brown, dorsa brown with black marginal sutures, area in mid-



Figures 36–40. *Caecilius juneae*. Female: 36, forewing; 37, hindwing; 38, subgenital plate; 39, gonapophyses; 40, spermapore sae. Figures 36, 37 and 38–40 to common scales.



Figures 41–43. *Caecilius juneae*. Male: 41, forewing; 42, hypandrium; 43, phallosome. Figures 42 and 43 to common scale.

line between dorsa cream; meso- and meta- thoracic pleura brown. Legs: coxa and apical tarsal segment brown, otherwise cream. Fore wing (fig. 36) with complex pattern of brown clouds and hyaline areas. Hing wing (fig. 37) pale brown, darker along anterior margin in basal half. Abdomen grey-brown dorsally, pale cream interconnecting islands indicating margins of terga; sterna grey-brown with wide pale cream bands.

Morphology. IO:D = 3.7. Clypeal shelf intermediate. Labral stylets small, spiculate; labral sensillae 5 in all; internal labral sclerotization present.

Lacinia broad, flat, expanded preapically on I side, with apical denticles. Vein cu_2 in fore wing setose, pterostigma with a distinct short spur vein bearing 2 setae; setae on veins *r, m+cu, an* and basal section of cu_1 in 2 ranks, remaining veins with setae in single rank. Mesothoracic precoxal suture absent. Epiproct rounded, setose. Paraprocts with oval field of 25 trichobothria and 1 seta not in rosette. Subgenital plate (fig. 38). Gonapophyses (fig. 39) with 1 or 2 setae on remnant of external valve; spermathecal sac (fig. 40) heavily sclerotised, spindle-shaped with clearly defined thick margin, spermathecal duct with obvious glandular structure over most of its length, duct in this region unsclerotised.

Dimensions. B 3.2, FW 3.80, HW 2.90, F 0.73, T 1.27, t_1 0.403, t_2 0.135, rt 3.0:1, ct 23, 0, f_1 0.651, f_2 0.391.

Description of male. Coloration (after ca 5 yr in alcohol). As female with the following exceptions: apical segment of maxillary palp dark grey, antennae brown. Prothoracic dorsa brown. Tibiae and tarsi of prothoracic legs light brown, tarsi of mesothoracic legs light brown, apical tarsal segment of hind leg light brown. Fore wing (fig. 41) generally light brown with darker brown markings, hyaline areas confined to regions of *rs-m* junction and vein cu_{1b}.

Morphology. IO:D = 1.6. Clypeus, labrum and lacinia as in female. Antenna thicker than that of female, basal flagellar segment bent . Vein cu_2 in fore wing setose, pterostigmal spur vein less distinct than in female but 2 setae present; setae of vein *r* and basal section of *an* in 2 ranks, remaining veins having setae of single rank. Mesothoracic precoxal suture as in female. Tibiae of uniform width, swellings absent. Epiproct rounded, setose. Paraproct with oval field of 32 trichobothria and more apical field of fine spinelets. Hypandrium (fig. 42) simple, setose. Phallosome (fig. 43) with penis bulb sclerotised, finely serrated.

Dimensions. B 2.3, FW 4.20, HW 2.90, F 0.77,

T 1.31, t_1 0.413, t_2 0.154, rt 2.7:1, ct 22, 0, f_1 0.738, f_2 0.479.

Etymology. This species is named after June Cheah, for her assistance with this project.

Remarks. This strikingly dimorphic species of tall open (site 7) and closed (site 8) forest differs from all others described from Australia in female wing pattern. The sexes were associated on the grounds of many instances of co-occurrence and the absence of any males with the female wing pattern and females with the male wing pattern; the head pattern with the obvious dark grey-black X sign centred on the ocellar protuberance is characteristic of both sexes.

The only other caeciliid described from Australia with a pterostigmal spur vein and vein cu_2 setose in the fore wing appears to be *Fuellebborniella parviramosa* Enderlein from Sydney, NSW. *F. parviramosa* is a much smaller species (fore wing length 2.5 mm) and the wing colour and head pattern appear to be different from *C. juneae*. The presence of ocelli, two ventral abdominal vesicles on the abdomen and 1 or 2 setae on the remnant of the external valve of the female indicate that *C. juneae* belongs within the subfamily Caeciliinae Mockford and not Fuellebborniellinae Mockford.

Caecilius pteridii Smithers

Caecilius pteridii Smithers, 1977: 257.

Material examined. 41♀, 22♂, 14 nymphs: site 1 (Nov 1985), site 2 (Feb 1986), site 3 (May, Jun 1985, Jan 1986), site 4 (May, Jul, Aug, Dec 1985, Jan 1986), site 5 (Nov, Dec 1985 – nymph only, Jan 1986), site 6 (Mar, Apr, May, Jun, Jul, Nov, Dec 1985, Jan, Feb 1986), site 7 (May 1985), site 9 (Dec 1985, Jan 1986), site 10 (Mar, Nov 1985, Jan 1986), site 11 (Sep, Nov 1985 – nymph only), site 14 (Apr 1990), site 25, site site 26, site 27, site 28 (Apr 1991), site 31, site 32.

Remarks. Originally described from near Sydney, NSW, this species has since been recorded from the Bass Strait islands and Victoria. On Wilsons Promontory it was found in most habitats.

Caecilius quercus Edwards

Caecilius quercus Edwards, 1950: 131.

Material examined. 56♀, 40♂, 21 nymphs: site 8 (Jul 1985), site 10 (Mar 1985, Jan, Feb 1986), site 11 (Mar, Dec 1985, Feb 1986), site 12, site 14 (Apr 1984, Jan 1991), site 15 (Apr 1984), site 16, site 17 (Jan 1985), site 25, site 27, site 29, site 30, site 33, site 34, site 37.

Remarks. This species is known from Tasmania, the Bass Strait islands, Victoria and Lord Howe Island. It was collected in a wide variety of vegetation types.

Caecilius semifuscatus (Tillyard)

Maoripsocus semifuscatus Tillyard, 1923: 191.
Caecilius semifuscatus. — Smithers, 1969: 280.

Material examined. 133♀, 70♂, 62 nymphs: site 1 (Jan, Feb, Mar, May, Jun, Aug, Sep, Oct, Nov, Dec 1985, Jan, Feb 1986), site 2 (Jun, Aug, Nov 1985, Jan, Feb 1986), site 3 (Jan, Feb 1986), site 4 (Jan, Feb 1986), site 10 (Mar, Sep, Nov, Dec 1985, Jan, Feb 1986), site 11 (Nov 1985, Feb 1986), site 14 (Apr 1984, Apr 1990), site 15 (Apr 1984), site 20, site 21, site 22, site 23, site 26, site 29, site 30, site 31, site 32, site 33, site 36, site 40.

Remarks. C. semifuscatus, originally described from New Zealand, is known from the Bass Strait islands, Victoria and South Australia. It was never collected in open or closed forest in this survey, but occurred predominantly in coastal vegetation of various types.

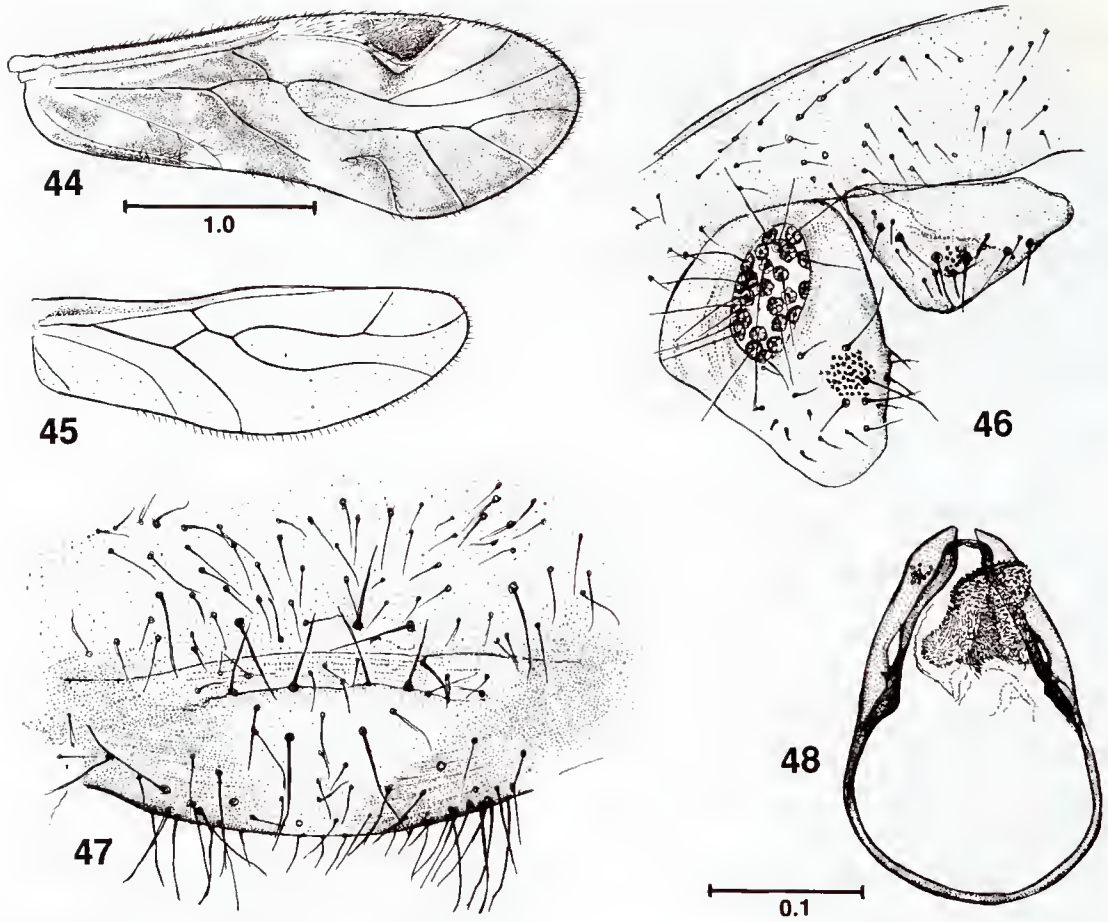
Caecilius wilsoni sp. nov.

Figures 44–48

Material examined. Holotype ♂: Lilly Pilly Nature Track, tall open forest, 21–23 Feb 1986 (K73445).

Description of male. Coloration (after ca 4 years in alcohol). Head generally pale buff. The following are brown: posterior vertex, a broad band each side of epicranial suture, narrow band bordering orbit, frons, striae on postclypeus, antenna. Gena pale brown, maxillary palp dark brown, ocellar protuberance dark brown, bordered brown, eyes dark grey. Thoracic terga brown, scutella dark brown, their marginal sutures black; a pale buff area just anterior to prothoracic scutellum; thoracic pleura brown. Legs: coxa and tarsal segments brown, tibia light brown at basal and distal ends, legs otherwise pale buff. Fore wing (fig. 44) patterned with hyaline areas and shades of brown from pale to mid brown (pterostigma). Hind wing (fig. 45) pale brown, costal cell darker. Abdomen pale buff.

Morphology. IO:D = 0.8. Clypeal shelf intermediate. Labral stylets small, spiculate; labral sensillae 5 in all; internal labral sclerotization present. Lacinia broad, flat, expanded preapically on 1 side, with apical denticles. Basal flagellar segment not enlarged or bent. Vein cu_2 of fore wing setose. Mesothoracic precoxal suture absent. Tibiae of uniform width, swellings absent. Epiproct (fig. 46). Paraproct (fig. 46) with an oval field of 27 trichobothria and a dis-



Figures 44–48. *Caecilius wilsoni*. Male: 44, forewing; 45, hindwing; 46, epiproct and paraproct; 47, hypandrium; 48, phallosome. Figures 44, 45 and 46–48 to common scales.

tinct field of small papillae. Hypandrium (fig. 47) simple, setose. Phallosome (fig. 48).

Dimensions. B 2.0, FW 2.90, HW 2.27, F 0.57, T 0.87, t_1 0.260, t_2 0.120, rt 2.1:1, ct 23, 0, f_1 0.513, f_2 0.339.

Female. Unknown.

Remarks. This rare species, described from a single male, is clearly related to *Caecilius semifuscatus*, which is common, and *C. fastigatus* Smithers, from New Zealand. *C. fastigatus* differs from both in head pattern, having an ivory vertex on an otherwise very dark brown head. *C. semifuscatus* and *C. wilsoni* differ in details of fore wing pattern.

Enderleinella Badonnel

Enderleinella Badonnel, 1932: 77. Type species: *Caecilius perlatus* Kolbe.

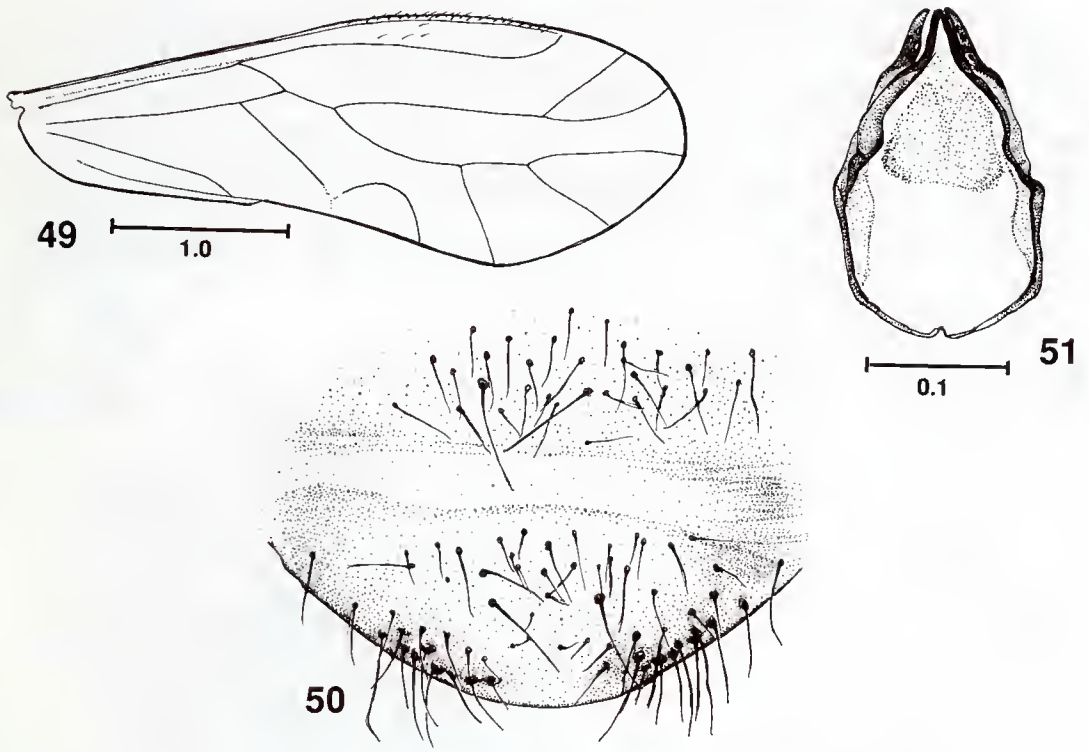
Enderleinella hilli Smithers

Figures 49–51

Enderleinella hilli Smithers, 1979: 62.

Material examined. Specimen on which description based: ♂, Lilly Pilly Nature Track, 'The Loop', closed forest, 29 Sep–1 Oct 1985. Additional records (327♀, 272♂, 210 nymphs): site 2 (Dec 1985, Feb 1986), site 4 (Jan 1986), site 5 (Sep, Oct, Nov, Dec 1985, Jan, Feb 1986), site 6 (Jan 1986), site 7 (Sep, Oct, Nov, Dec 1985, Jan 1986), site 8 (Jul, Aug, Sep, Oct, Nov, Dec 1985, Jan 1986), site 9 (Jan, Feb 1986), site 10 (Dec 1985, Jan, Feb 1986), site 11 (Aug, Nov, Dec 1985, Jan, Feb 1986), site 19, site 25, site 26, site 28 (Apr 1990, Apr 1991), site 29, site 30, site 38, site 39.

Description of male. Coloration (after ca 5 yr in alcohol). As female with the following exceptions: scape, pedicel and apical 4 segments of flagellum pale brown, remainder brown; tibia



Figures 49–51. *Enderleinella hilli*. Male: 49, forewing; 50, hypandrium; 51, phallosome. Figures 50 and 51 to common scale.

and tarsus of prothoracic leg pale brown, thoracic terga mid brown.

Morphology. IO:D = 0.5. Fore wing (fig. 49). Epiproct semicircular, membranous. Paraproct with an oval field of 22 trichobothria. Hypandrium (fig. 50) with rounded posterior margin, setose except posteromedially. Phallosome (fig. 51).

Dimensions. B 2.3, FW 3.75, HW 2.77, F 0.72, T 1.23, t_1 0.395, t_2 0.118, rt 3.3:1, ct 28, 0, f_1 0.727, f_2 0.656.

Remarks. This species was described from Tasmania from a single female. The sclerotised area of the paraproct mentioned by Smithers (1979) is also distinguishable in the male. The species was collected quite frequently during summer months in almost all vegetation types.

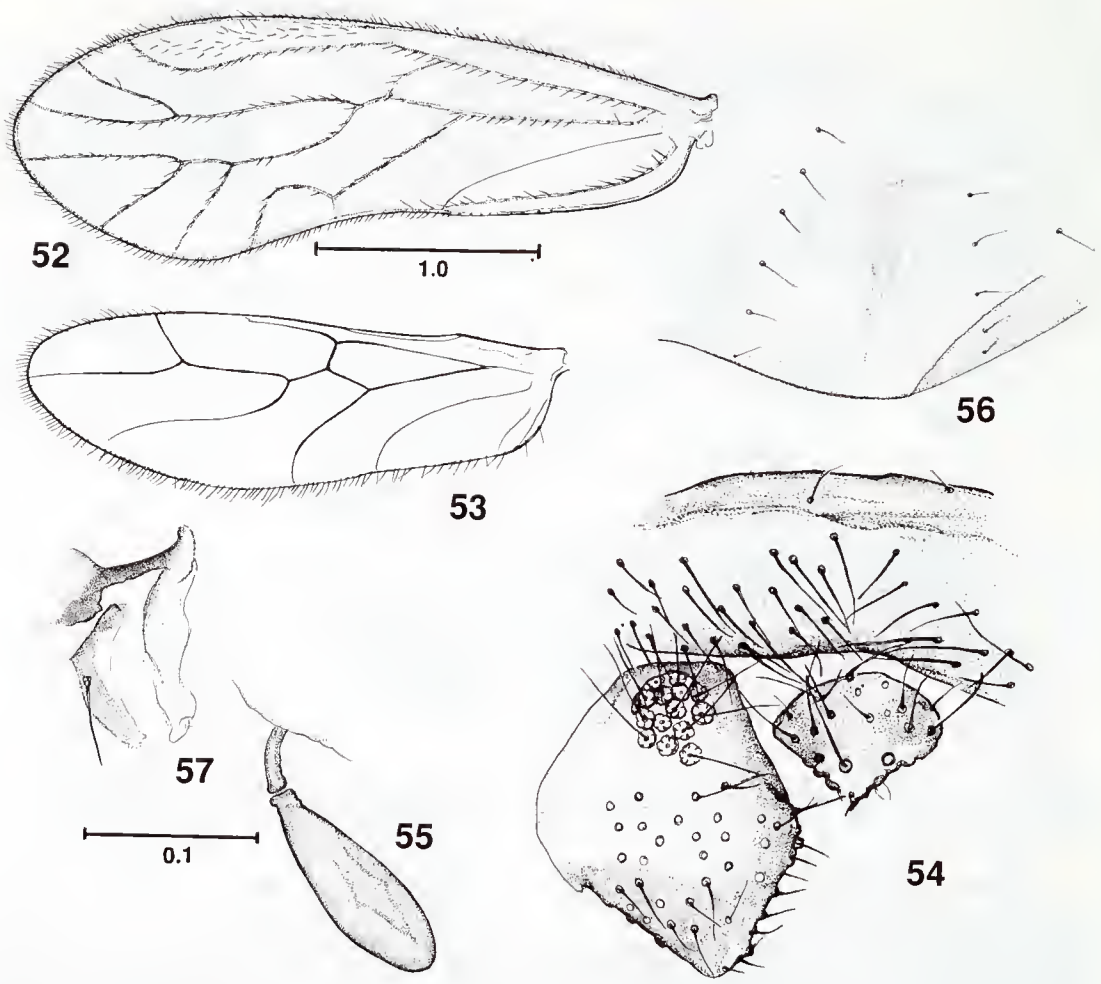
Enderleinella selta sp. nov.

Figures 52–61

Material examined. Holotype ♀: Waterpump shed, *Melaleuca ericifolia* scrub, 8–10 Sep 1985; allotype ♂, 46 nymphs, 113♀ and 63♂ paratypes: same data as holotype (K73446–K73623). Additional records (574♀, 769♂, 312 nymphs): site 1 (Dec 1985, Jan 1986), site 2 (May, Sep, Nov, Dec 1985, Jan, Feb 1986), site 3 (Mar, Apr, May, Jun, Jul, Aug, Nov, Dec 1985, Jan, Feb 1986), site 4 (Mar, Dec 1985, Jan, Feb 1986), site 5 (Jan, Jun, Sep, Nov, Dec 1985, Jan, Feb 1986), site 6 (Dec 1985, Jan, Feb 1986), site 8 (Jul, Dec 1985, Jan 1986), site 9 (Mar, Sep, Nov, Dec 1985, Jan 1986), site 9 (Mar, Sep, Nov, Dec 1985, Jan, Feb 1986), site 11 (Jan 1985), site 14 (Apr 1984), site 15 (Apr 1984), site 16, site 20, site 22, site 26.

Description of female. Coloration (after ca 5 yr in alcohol). Body generally pale buff with the following exceptions: a suggestion of greyish coloration between eyes, on postclypeal striae and stirrup mark on frons. Median epicranial suture and setae dark brown. Ocellar protuberance pale, ocelli pale. Eyes black. Gena cream. Apical segment of maxillary palp greyish in apical half. Basal flagellar segment pale brown, rest of flagellum brown. Prothoracic nota light brown, apical tarsal segment greyish. Abdomen cream. Fore wing (fig. 52) hyaline with a faint brownish tinge, slightly darker in anal cell. Hind wing (fig. 53) hyaline.

Morphology. IO:D = 1.5. Anterior margin of labrum sclerotised. Epiproct (fig. 54). Paraproct (fig. 54) with oval field of 16 trichobothria, scler-



Figures 52–57. *Enderleinella selta*. Female: 52, forewing; 53, hindwing; 54, epiproct and paraproct; 55, spermapore sac; 56, subgenital plate; 57, gonapophyses. Figures 52, 53 and 54–57 to common scales.

ification similar to *E. hilli*, bifid cone present posteriorly with seta through middle. Spermatheca (fig. 55). Subgenital plate (fig. 56) simple, setose. Gonapophyses (fig. 57) as 2 membranous lobes, 1 bearing a single seta.

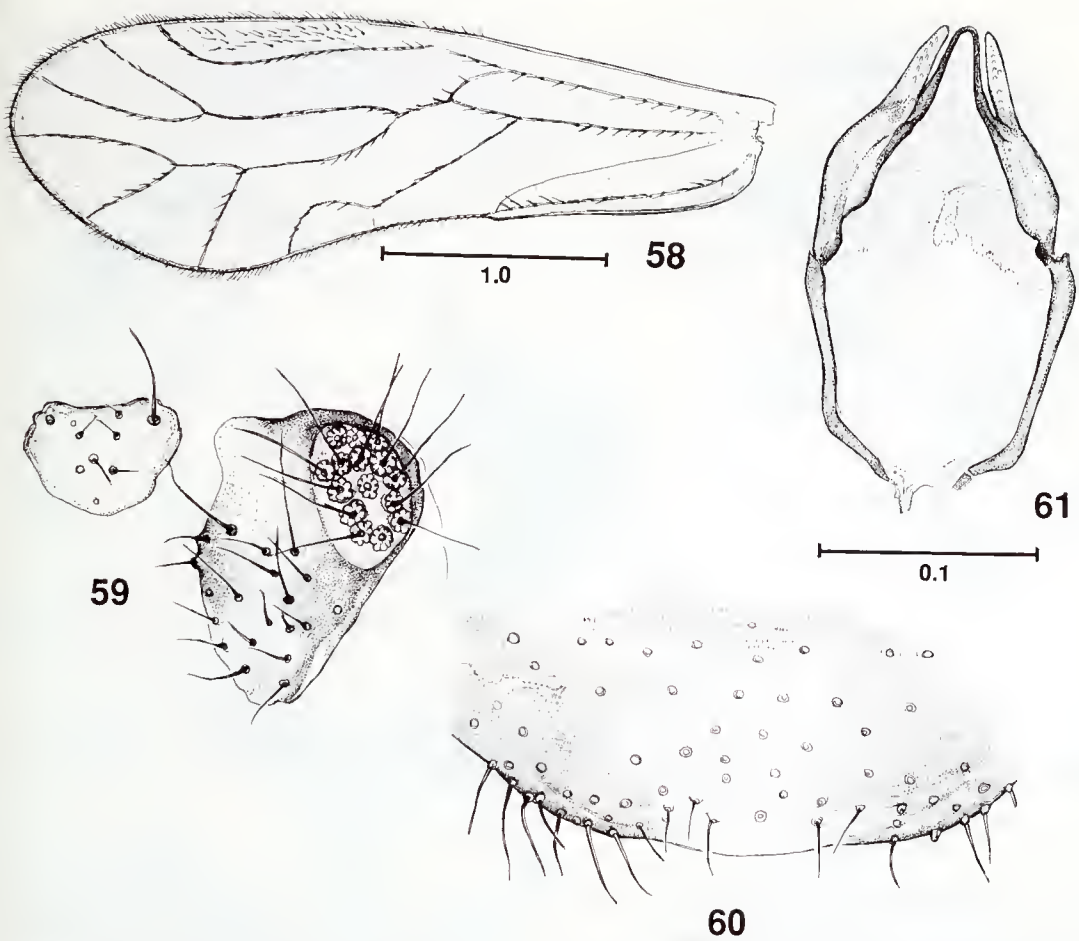
Dimensions. B 2.3, FW 3.10, HW 2.42, F 0.61, T 1.04, t_1 0.332, t_2 0.134, rt 2.5:1, ct 19, 0, f_1 0.499, f_2 0.384.

Description of male. *Coloration* (after ca 5 years in alcohol). As female with following exceptions: flagellum and mesothoracic nota brown, metathoracic nota light brown. Fore wing (fig. 58) very pale brown.

Morphology. IO:D = 1.0. Antenna generally as female but flagellum thicker, longer. Epiproct (fig. 59) semi-circular. Paraproct (fig. 59) with oval field of 13-16 trichobothria. Hypandrium (fig. 60) simple, posterolateral margin setose, sclerotised. Phallosome (fig. 61) angular, outer parameres broad at base, tapering to apex.

Dimensions. B 2.0, FW 3.21, HW 2.51, F 0.63, T 1.11, t_1 0.356, t_2 0.126, rt 2.8:1, ct 23, 0, f_1 0.730, f_2 0.605.

Remarks. Like the previous species, *E. selta* is widely distributed on Wilsons Promontory. Three Australian species of *Enderleinella* and one New Zealand species are closely similar in morphology and general colour. *E. selta* is consistently smaller than the other species, the sympatric *E. hilli*, *E. globiclypeus* (Enderlein), which has a more northerly distribution in Australia, and *E. zelandica* (Tillyard) (New Zealand). As



Figures 58–61. *Enderleinella selta*. Male: 58, forewing; 59, epiproct and paraproct; 60, hypandrium; 61, phallosome. Figures 59–61 to common scale.

pointed out by Smithers (1979) the ventral valve of the female gonapophyses of *E. hilli* (length about twice width) is a different shape from those of *globiclypeus* and *zelandica* (length about 4 times width). *E. selta* conforms with the last two species in this character.

E. hilli and *E. selta*, as is often the case with closely similar species, are not difficult to distinguish when seen together. *E. selta* is smaller, the setae on the fore wing veins more prominent, and the general colour more buff than pale cream as in *E. hilli*.

Amphipsocidae Pearman

Taeniostigma Enderlein

Taeniostigma Enderlein, 1901: 546. Type species: *Psocus elongatus* Hagen.

Taeniostigma trickettae Smithers

Taeniostigma trickettae Smithers, 1974: 211.

Material examined. 10♀, 1♂, 24 nymphs: site 5 (Jan 1985), site 7 (Sep, Oct, Dec 1985, Jan 1986), site 8 (Nov, Dec 1985, Jan, Feb 1986), site 28 (Apr 1990), site 38 (nymph only).

Remarks. This species of closed (site 8) and tall (site 7) open forest is also found in other areas of Victoria, NSW and southern Queensland.

Ectopsocidae Roesler

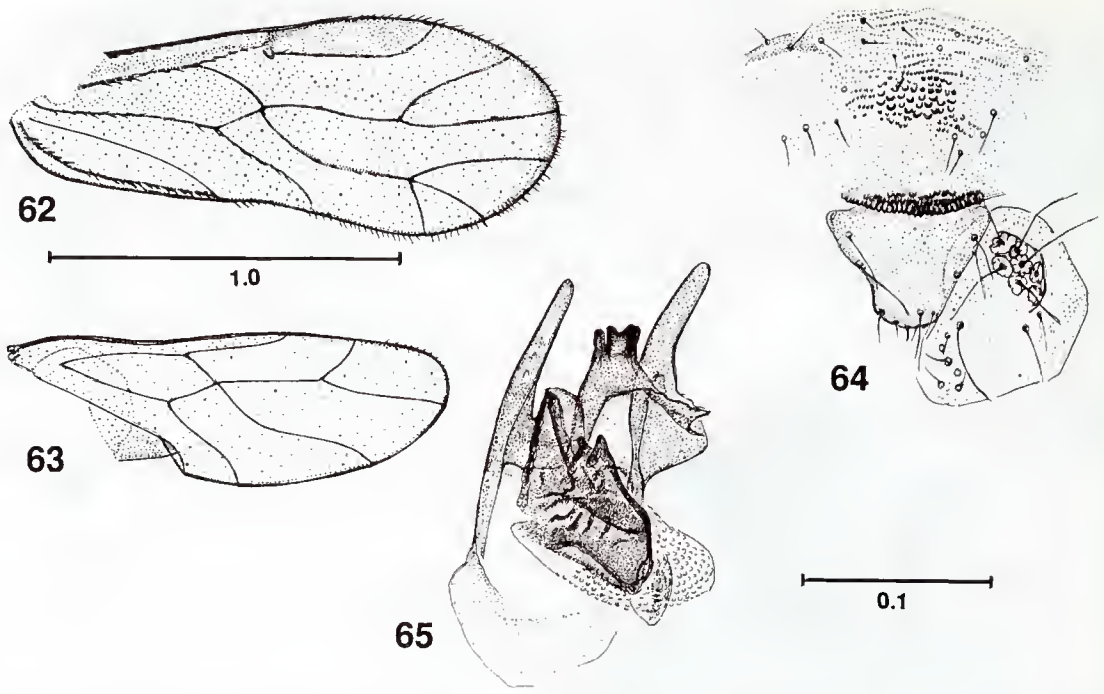
Ectopsocus McLachlan

Ectopsocus McLachlan, 1899: 277. Type species: *Ectopsocus briggsi* McLachlan.

Ectopsocus acutistigma sp. nov.

Figures 62–69

Material examined. Holotype ♂: Lilly Pilly Nature Track, heath, 12–15 Mar 1985; allotype ♀, 2♂ paratypes: same locality as holotype, 23–26 Jun 1985 (K73624–K73627). Additional record (1♂): site 7 (Mar 1985).



Figures 62–65. *Ectopsocus acutistigma*. Male: 62, forewing; 63, hindwing; 64, epiproct, paraproct and ninth tergite; 65, phallosome. Figures 62, 63 and 64, 65 to common scales.

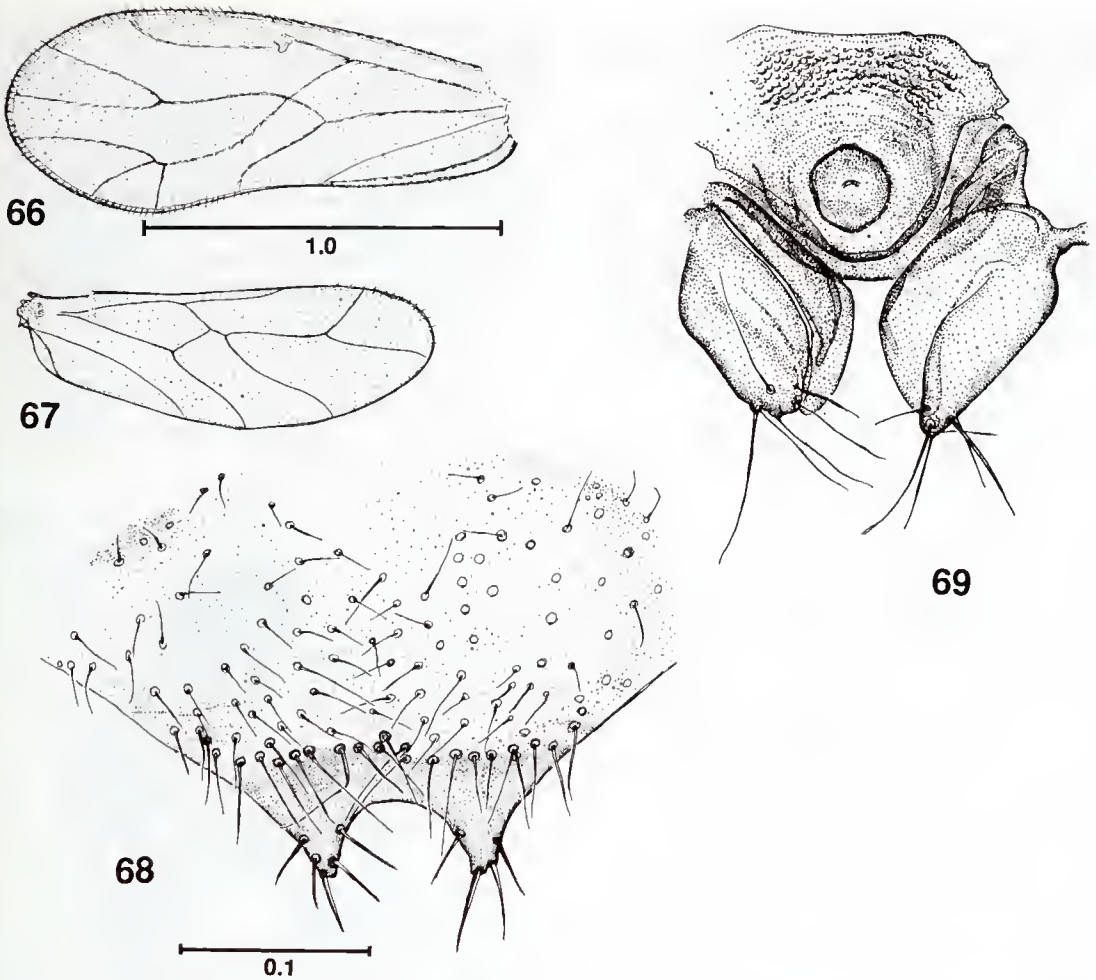
Description of male. Coloration (after ca 5 yr in alcohol). Body color generally pale buff with following exceptions: eyes black, ocelli with black centripetal margins, usual vertex marks pale brown, postclypeus with pale brown striae, abdomen with grey-brown granulations. Fore wing (fig. 62) uniformly suffused very pale brown. Hind wing (fig. 63) paler.

Morphology. IO:D = 6.0. Antenna slightly thicker than in female. In fore wing (fig. 62), veins *rs* and *m* meet at a point, veins m_2 and m_3 originate very close to one another (in 1 wing at a tripartite junction with m_1); pterostigma long, r_1 meets costa at an acute angle; veins with single row of small setae. In hind wing (fig. 63) veins *rs* and *m* connected by short cross vein in 1 wing, by short fusion in the other; wing devoid of setae apart from 12 setae on costa between termination of r_{2+3} and r_{4+5}. Flagellar segments thick, with setae of greater length than thickness of flagellum. Epiproct (fig. 64). Paraproct (fig. 64) with oval field of 7 or 8 trichobothria. Ninth tergite (fig. 64) with clunial comb of blunt teeth in 3 ranks, anterior rank sparse and teeth low; more anteriorly a field of broad, rounded low tubercles. Hypandrium simple, setose. Phallosome (fig. 65) with large penial bulb sclerites; apex of inner parameres fused into a bilobed terminal process between a pair of short, rounded terminal prongs.

Dimensions. B 1.5, FW 1.62, HW 1.30, F 0.14, T 0.22, t_1 0.174, t_2 0.087, rt 2.0:1, ct 12, 0, f_1 0.237, f_2 0.130.

Description of female. Coloration (after ca 5 yr in alcohol). As male, but scape, pedicel, tibia and tarsus pale brown.

Morphology. IO:D = 6.5. In fore wing (fig. 66), as in male, veins m_2 and m_3 originate close together and m_1 is long; veins *rs* and *m* fused for a very short distance or meet in a point; pterostigma and ciliation as male. Hind wing (fig. 67) veins *rs* and *m* fused for a distance (both wings), wing bare apart from 3 marginal setae between termination of r_1 and r_{2+3} and 9 between r_{2+3} and r_{4+5}. Flagellum more slender than that of male, length of setae up to twice thickness of flagellar segments. Epiproct similar to that of male; paraproct with oval field of 7 or 8 trichobothria. Subgenital plate (fig. 68) apical lobes with 5 and 4 stout marginal setae. Gonapophyses (fig. 69) with 3 distinct valves, dorsal and ventral valves



Figures 66–69. *Ectopsocus acutistigma*. Female: 66, forewing; 67; hindwing; 68, subgenital plate; 69, gonapophyses and spermapore plate. Figures 66, 67 and 68, 69 to common scales.

very finely spiculate, outer valves with 6 and 7 terminal setae. Spermapore plate (fig. 69) with distinct concentric pattern of sclerotisation and anterior rugose area.

Dimensions. B 1.3, FW 1.45, HW 1.15, F 0.35, T 0.41, t_1 0.144, t_2 0.077, rt 1.9:1, ct 12, 0, f_1 0.197, f_2 0.103.

Remarks. This appears to be a forest species.

In the shape of the pterostigma *E. acutistigma* most resembles *Ectopsocus ornatus* Smithers and Thornton from Norfolk Island, which it also resembles in features of male and female genitalia. *E. acutistigma* can be distinguished, however, by the plain wing lacking terminal vein spots, the details of the fusion of the inner parameres of the phallosome and the multiple-ranked comb of the male clunium. A feature of this species is the venation of the wings — in none of the five specimens is *rs* and *m* in the fore wing joined by a cross vein, in all of them veins m_2 and m_3 originate close together and veins *rs* and *m* in the hind wing are fused, the length of fusion being greater in males. *Ectopsocus axillaris* (Smithers), also found at Wilsons Promontory (as well as New Zealand), has similar venational peculiarities apart from the pterostigma and the relationship between veins m_1, m_2, and m_3. It can be distinguished from *E. acutistigma* by the non-uniformly pigmented fore wing and by the very dark brown head and thorax. In *Ectopsocus brunneus* (Edwards), which also has veins *rs* and *m* fused in the hind wing, the female fore wing has small spots at the apices of the veins, and the ocellar tubercle is black; the colour pattern of the head and thorax

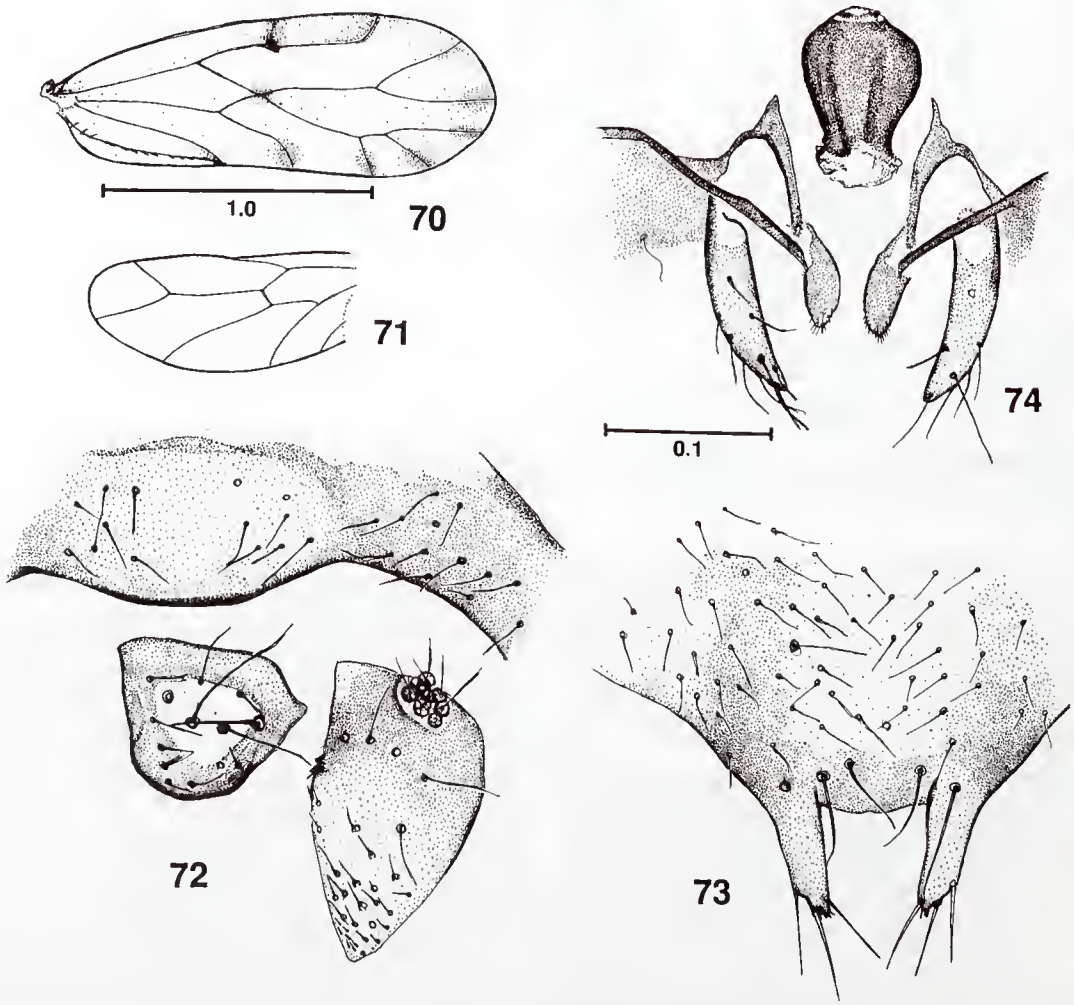
is also quite distinct from the uniformly pale head of *E. acutistigma*.

Ectopsocus australis sp. nov.

Figures 70–79

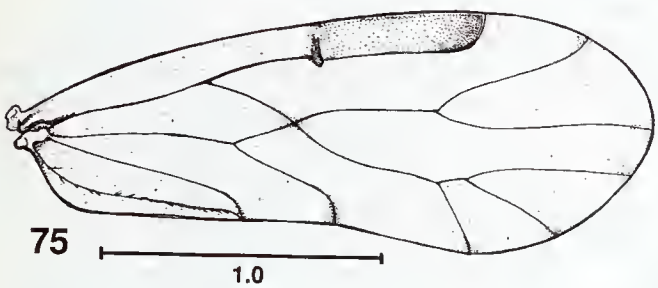
Material examined. Holotype ♀: Lilly Pilly Nature Track – 'The Loop', closed forest, 15–16 Dec 1985; allotype ♂, 1 nymph, 7♀ and 8♂ paratypes: same data as holotype (K73628–K73644). Additional records (90♀, 29♂, 12 nymphs): site 5 (Sep 1985), site 7 (Mar, Nov 1985, Jan, Feb 1986), site 8 (Jan, Feb, Mar, Apr, May, Jun, Aug, Sept, Oct, Nov 1985, Jan, Feb 1986, Jan 1991), site 9 (May 1985), site 10 (Dec 1985), site 11 (Dec 1985), site 12, site 14 (Jan 1991), site 19, site 25, site 28 (Apr 1990, Apr 1991), site 29, site 32, site 38, site 44.

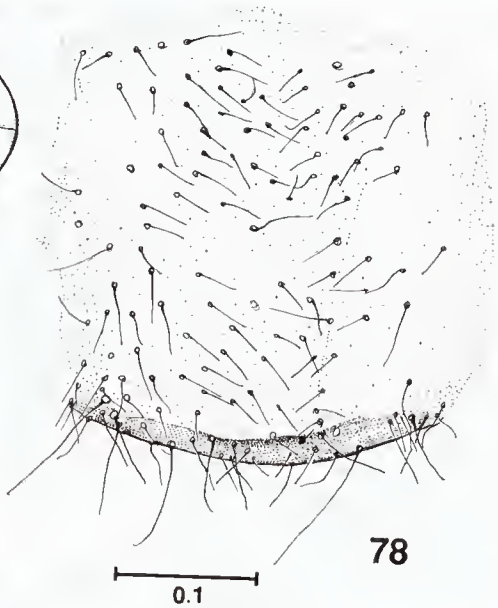
Description of female. Coloration (after ca 5 yr in alcohol). Head buff with vertex marks (as large pigment patches), triangular frons mark, postclypeal striae, and line from antennal socket to orbit, brown. Gena and maxillary palp very pale buff, apical segment of palp slightly greyish. Scape and pedicel light brown, flagellum buff. Eyes black. Ocelli pale, their surrounds pale. Thoracic terga brown with paler margins, a dark brown line along cervicum and side of thorax, legs very pale buff. Fore wing (fig. 70) membrane greyish, a little paler near margin, with 10 distinct spots at ends of veins and *rs-m* junction. Hind wing (fig. 71) hyaline. Abdomen pale buff with dark grey-brown pigment on dorsolateral areas of terga.

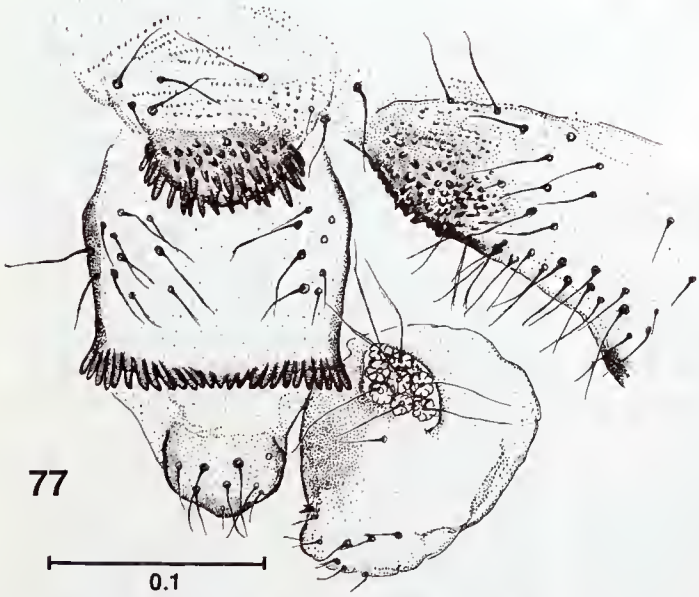


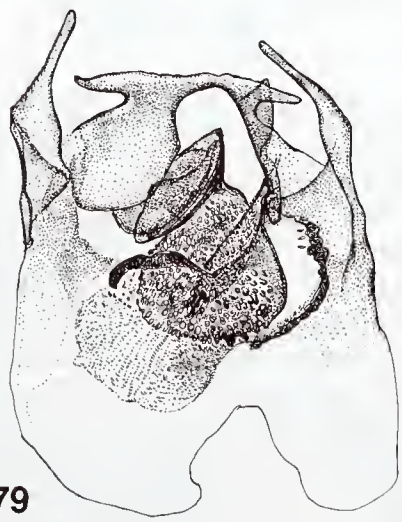
Figures 70–74. *Ectopsocus australis*. Female: 70, forewing; 71, hindwing; 72, epiproct and paraproct; 73, subgenital plate; 74, gonapophyses and spermathecal sac. Figures 70, 71 and 72–74 to common scales.

Morphology. IO:D = 8.5, eyes small. Epiproct (fig. 72) setose. Paraproct (fig. 72) with field of 9 trichobothria and pair of spines of unequal length (and 1 associated seta) joined approximately third length of largest spine from base. Subgenital plate (fig. 73) setose with transverse row of 6 large setae near apical margin of disc (1 socket displaced during preparation), central apical margin of disc with pigmented area bearing very fine spicules near midline; apical lobes fairly straight and separated from disc by a suture basally, apically with 3 stout setae, between inner pair a spiculate projection; disc heavily sclerotised laterally as basal continuation of apical lobes. Gonapophyses (fig. 74): outer valves curved toward midline, bearing 7–9 setae, apices finely spiculate, valves at least twice as large as dorsal valves, which are short, broad, tapering to spiculate apices; ventral valves long, narrow, spiculate; spicules on dorsal valve longer than those of other valves. Between ventral valves a large sclerotised 'spermathecal









Figures 75–79. *Ectopsocus australis*. Male: 75, forewing; 76, hindwing; 77, epiproct, paraproct and ninth tergite; 78, hypandrium; 79, phallosome (paratype). Figures 75, 76 and 77 and 79 to common scales.

sac' (fig. 74) similar in shape and structure to that described by Mockford (1959) for *Ectopsocus californicus* (Banks).

Dimensions. B 1.65, FW 1.62, HW damaged, FW 0.38, T 0.63, t_1 0.190, t_2 0.087, rt 2.2:1, ct 12, 0, f_1 0.292, f_2 0.170.

Description of male. Coloration (after ca 5 yr in alcohol). Head pattern as female but overall darker; area between ocelli brown, an isolated paler area posterior to this with appearance of a fourth ocellus. Thoracic terga brown with paler margins, sides of thorax brown. Dark line along cervicum not extending to thorax. Fore wing (fig. 75) generally as female but spots at apices of veins near wing apex not well marked (6 distinct spots, 2 indistinct). Hind wing (fig. 76) hyaline. Legs and abdomen as female.

Morphology. IO:D = 3.5, eyes fairly large. Fore wing larger than female, flagellum thicker. Epiproct (fig. 77) setose. Paraproct (fig. 77) with field of 9 trichobothria, duplex spines and associated seta as female. Ninth tergite (fig. 77) with apical comb of long rounded teeth, shorter and directed towards midline over central section. Apex of eighth tergite with semicircular field of thick blunt spines, long apically and progressively shorter basally. An ill-defined field of spines on ninth sternite lateral to the field on the eighth tergite. Hypandrium (fig. 78) with slightly curved, somewhat sclerotised apical margin. Phallosome (fig. 79 – paratype) very similar to that of *Ectopsocus punctatus* Thornton and Wong, with a single 'thimble' structure near apex of fused inner parameres.

Dimensions. B 1.45, FW 2.21, HW 1.71, F 0.41, T 0.72, t_1 0.245, t_2 0.091, rt 2.7:1, ct 15, 0, f_1 0.375, f_2 0.253.

Remarks. Taken predominantly in closed forest (site 8), the species was also found in open forest (sites 7, 9 and 19) and closed scrub.

There are five described species of the *briggsi* group of *Ectopsocus* with a hyaline fore wing having dark spots at the apices of the veins and at the *rs-m* junction: *E. briggsi* McLachlan, *E. californicus* (Banks), *E. froggatti* Enderlein, *E. meridionalis* Ribaga and *E. punctatus* Thornton and Wong [*E. congener* Tillyard was placed in synonymy with *E. californicus* by Smithers (1969)]. *E. meridionalis* is known only from the female and is parthenogenetic. Jentsh (1939) clearly demonstrated differences between *E. briggsi* and *E. meridionalis*, which were supported in part by Badonnel (1943). The type (female) of *E. froggatti* is unavailable (lost), but Edwards (1950) described a common species from Tasmania that he identified with *E. froggatti*, including descriptions of both sexes. The following references are thus to *E. froggatti* (*sensu* Edwards). Mockford (1959) treated the *briggsi* complex of North and South America, noting and illustrating differences between *E. briggsi, E. californicus* and *E. meridionalis*. In describing *E. punctatus*, Thornton and Wong (1968) noted its resemblance to both *E. briggsi* and *E. froggatti*, but pointed out differences from these species; the holotype female and male allotype of this New Zealand species have been re-examined.

Ectopsocus australis differs from the following in having a subgenital plate in which the apical lobes are separated from the main plate by a suture which appears to be a continuation of the mesial margin of each lobe: *briggsi, californicus, punctatus* and *rileyae* (below). It differs from the following in that between the terminal setae of the apical lobes of the subgenital plate there is a small but distinct projection: *californicus, froggatti* and *rileyae*. In *briggsi* and *punctatus* this projection is smoothly rounded apically; in *meridionalis* and *australis* it is spiculate. Enderlein (1906) noted that a diagnostic feature of *E. froggatti* was the head pattern, consisting of small dark spots as previously figured by him under the name *E. briggsi* (Enderlein, 1903: pl. VII fig. 47). Edwards (1950: 128) noted this feature in his description of Tasmanian specimens that he assigned to *froggatti*. The specimens from Wilsons Promontory lack such a pattern. In the possession of a massive, characteristically-shaped sclerotisation associated with the female gonopore, *australis* resembles only *E. californicus*; the other five species lack this structure. The spine on the edge of the paraproct of *californicus* is single, in *briggsi* and *froggatti* it is a duplex spine, incompletely divided, with each member of the pair of similar size; in *meridionalis* there is a similar duplex spine with one member of the pair much larger than the other. The paraproct of *australis, punctatus* and *rileyae* has two adjacent but almost separate spines. The phallosome of *australis* most closely resembles that of *punctatus* and *rileyae* in the possession of one thimble-like structure towards the apex of the frame; in *briggsi* there is a pair of thumb-like structures, and *californicus* and *froggatti* evidently lack any such structures. The ornamentation of the eighth tergite of *australis* again resembles that of *punctatus* as well as *californicus*; a fairly extensive field of strong spines is present. In *briggsi* there is but a single row of

Table 3. Features distinguishing seven species of *Ectopsocus* which have clear fore wings with spots at the ends of veins and at the *rs-m* junction.

	Female subgenital plate						
	Apical lobes separated from disc by suture	Shape of apical lobes	Projection between distal setae of apical lobe	Paraproct spines	Spermathecal sac	Phallosome 'thimble' structures	Spines of eighth tergite
E. australis	yes	straight	spiculate	duplex, unequal, adjacent	yes	single	field
E. briggsi	no	curved	smooth	duplex, equal	no	pair	row
E. californicus	no	straight	absent	single	yes	absent	field
E. froggatti	yes	straight	absent	duplex, equal	no	absent	row/field
E. meridionalis	yes	straight	spiculate	duplex, unequal	no	male unknown	male unknown
E. punctatus	no	curved	smooth	duplex, unequal, adjacent	no	single	field
E. rileyae	no	straight	absent	duplex, unequal, adjacent	no	single	absent

spines (Badonnel, 1943), and from Edwards' figure of what he identified as *froggatti* there appears to be a row of spines bordering a more distal field of smaller spines. Thus *E. australis* has features (listed above) that are similar to one or more of the other six species, except *E. briggsi* (summarised in Table 3).

E. australis shows remarkable sexual dimorphism in general colour, in the absence of the lateral thoracic stripe in the male and the very much larger male wings. We have associated the sexes on the basis of finding them together in 11 collections from 13 localities, and in never finding females similar to the males nor males similar to the females in these collections.

Ectopsocus axillaris (Smithers)

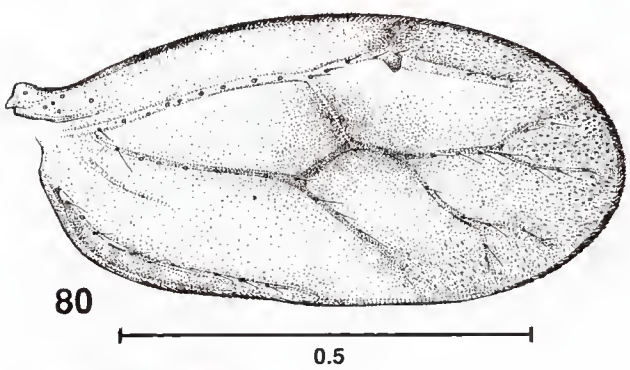
Figures 80–84

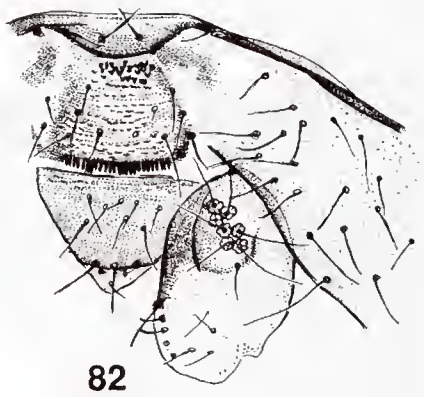
Interpsocus axillaris Smithers, 1969: 293.
Ectopsocus axillaris. — New, 1973b: 348.

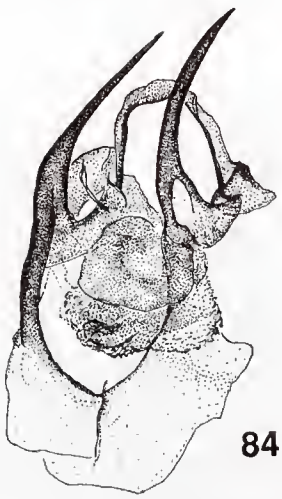
Material examined. Specimen on which description based: ♂, Little Waterloo Bay, *Acmena smithii*, 27 Apr 1989. Additional records (14♀, 3♂): site 8 (Sep, Oct, Dec 1985, Jan 1986), site 25.

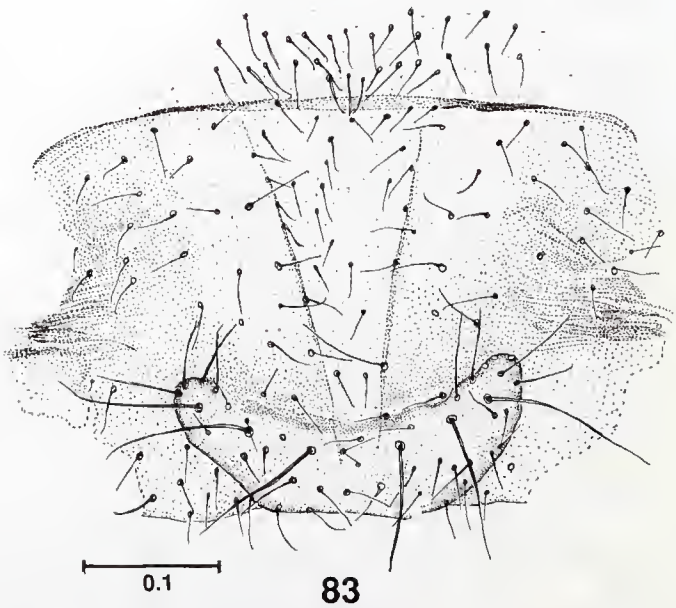
Description of male. *Coloration* (after ca 1 yr in alcohol). As female except thorax somewhat less dark.

Morphology. IO:D = 5.5 (IO:D = 5.5 for ♀ by Pearman's method; see Ball, 1943). Head









Figures 80–84. *Ectopsocus axillaris*. Male: 80, forewing; 81, hindwing; 82, epiproct, paraproct and ninth tergite; 83, hypandrium; 84, phallosome. Figures 80, 81 and 82–84 to common scales.

shining. Fore wing (fig.80), brachypterous. Hind wing (fig. 81). Epiproct (fig. 82) trapezoid with group of 8 setae over basal half, a transverse row of 3 setae in apical third and 3 much smaller setae near apex; basal margin with 2–3 rows of very fine spicules. Paraproct (fig. 82) with 7 trichobothria and 1 seta not in rosette, duplex spines only slightly larger than setal boss, spines divided only in apical third, each member of pair same size. Ninth tergite (fig. 82) with transverse apical comb of 1 row of long narrow teeth, in apical half with rows of spicules larger than those of epiproct; basally with field of broad irregular short spines of various sizes, no ornamentation lateral to this. Hypandrium (fig. 83 with apex folded towards anterior) with subapical transverse row of 6 very long setae, apical margin slightly concave. Phallosome (fig. 84): phallic frame broad anteriorly with median line of fusion, outer parameres projecting posteriorly as long, sharp, curved spines; fusion of inner parameres without lateral horns, large phallosome sclerites.

Dimensions. B 1.5, FW 0.71, HW damaged. F 0.38, T 0.61, t_1 0.197, t_2 0.083, rt 2.37:1, ct 8, 0, f_1 0.265, f_2 0.170.

Remarks. We provide a description of the male of this species, hitherto only known from the female. Found only in closed forest and on *Acmena smithii*, the species was not previously recorded in Australia. It was described from three macropterous females from New Zealand. Both macropterous and brachypterous females have been collected at Wilsons Promontory.

Ectopsocus briggsi McLachlan

Ectopsocus briggsi McLachlan, 1899: 277.

Material examined. 114♀, 5♂, 3 nymphs: site 5 (Sep 1985), site 7 (Feb, Sep, Oct 1985), site 8 (Sep, Oct, Nov 1985), site 9 (Nov 1985), site 11 (May 1985), site 24, site 38.

Remarks. This cosmopolitan species, collected here from forest, closed heath and scrub, and from *Banksia serrata*, is known from Norfolk Island, the Bass Strait islands and Victoria.

Ectopsocus californicus (Banks)

Peripsocus californicus Banks, 1903: 237.
Ectopsocus californicus. — Peck, 1951: 413.

Material examined. 22♀, 16♂, 1 nymph: site 11 (Mar 1985, Jan, Feb 1986), site 12, site 14 (Apr 1990, Jan 1991), site 34.

Remarks. Australian records of this species include NSW, Victoria, Tasmania and South Australia.

Ectopsocus edwardsi New

Ectopsocus edwardsi New, 1973b: 347.

Material examined. 204♀, 48♂, 11 nymphs: site 1 (Jan 1986), site 2 (Feb, Mar, Nov 1985), site 9 (Feb, Mar, May, Nov 1985, Feb 1986), site 10 (Dec 1985), site 11 (Feb, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec 1985, Jan, Feb 1986), site 27, site 30, site 32.

Remarks. E. edwardsi, originally described from Wilsons Promontory, is only known from Victoria. Micropterous, brachypterous and macropterous females and males were collected here, chiefly from *Banksia serrata* (site 11), but also from coastal vegetation and low eucalypt woodland.

Ectopsocus pteridii Smithers

Ectopsocus pteridii Smithers, 1977: 265.

Material examined. 29♀, 11♂, 1 nymph: site 8 (Mar, Nov 1985, Jan, Feb 1986, Jan 1991), site 28 (Apr 1990), site 42.

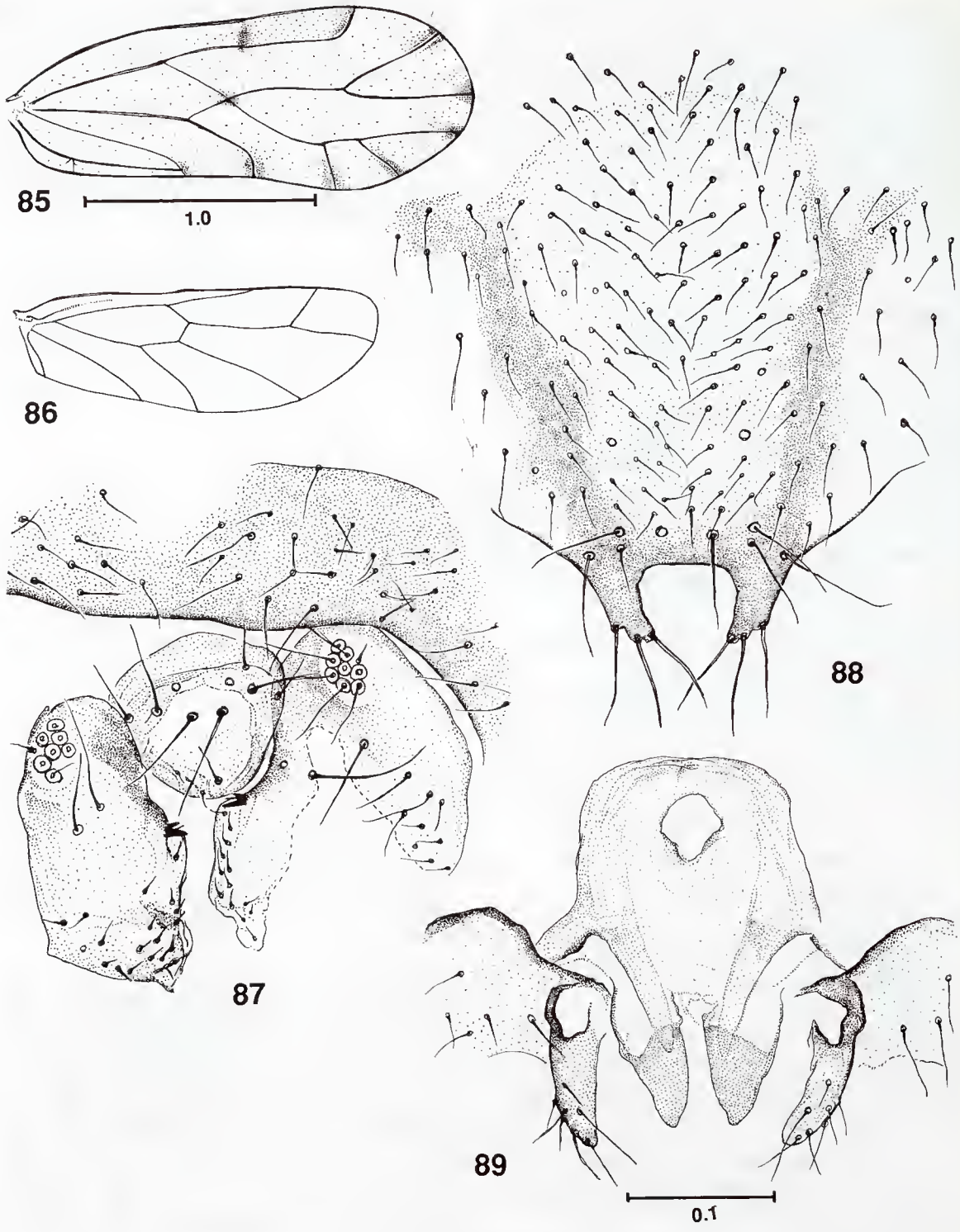
Remarks. This is the first record of this species since its description from near Sydney, NSW. Here it was collected only from tree ferns associated with closed forest and scrub.

Ectopsocus rileyae sp. nov.

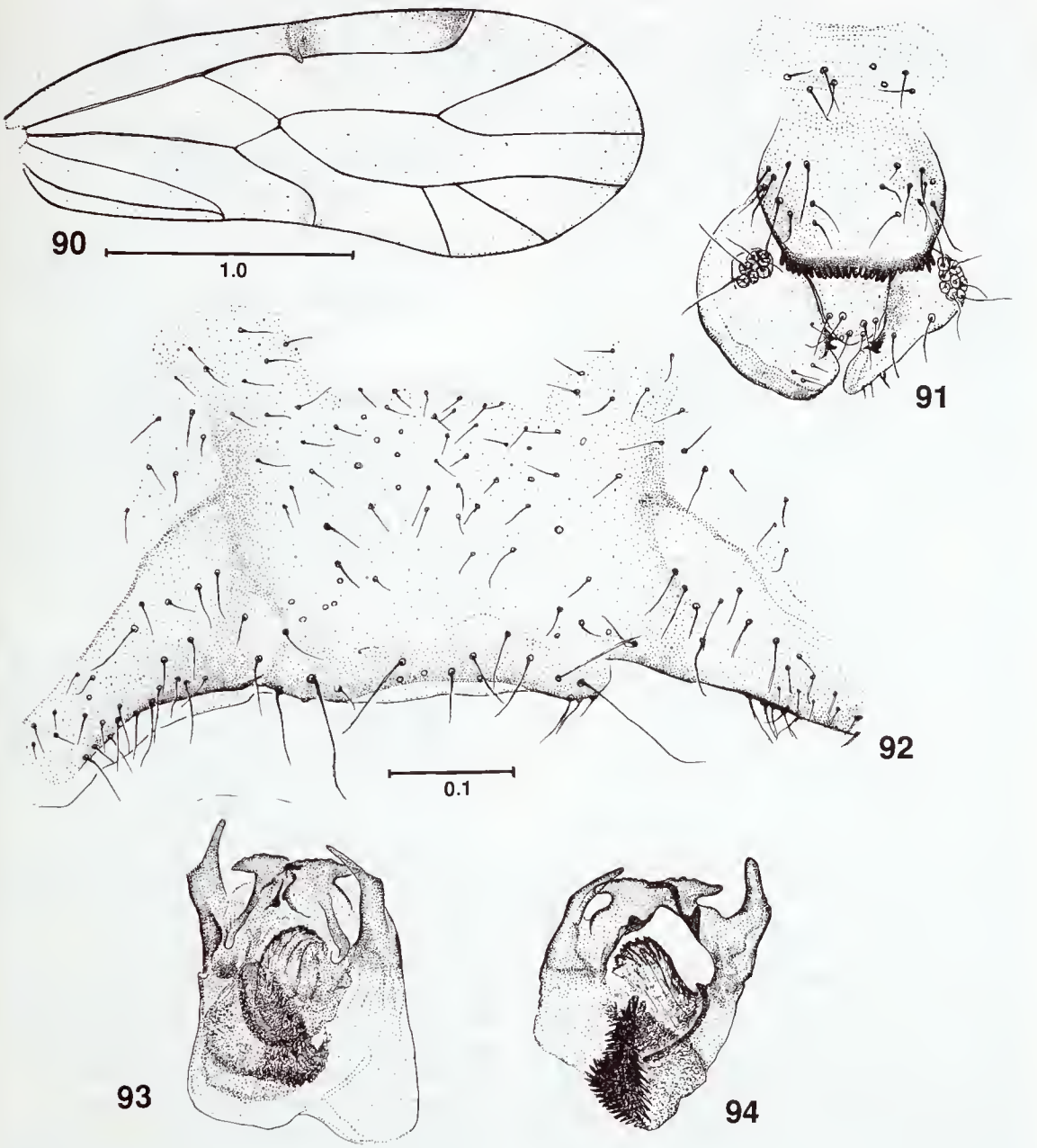
Figures 85–94

Material examined. Holotype ♀: Mt Maurice Walking Track, Tasmania, dead *Eucalyptus* leaves, 22 Feb 1988; allotype ♂, 2♀ and 1♂ paratypes: same data as holotype (K73645–K73649). Additional records (4♀): site 7 (Nov 1985, Jan 1986), site 19, site 28. Additional specimen before us: ♂, Tunbridge–Lake Sorrell Road, Tasmania, *Acacia melonoxylon*, 14 Aug 1986 (phallosome drawn).

Description of female. Coloration (after ca 3 yr in alcohol). Head generally buff with brown markings as follows: on vertex each side of median epicranial suture but leaving a buff stripe along midline; parallel to orbital margins again leaving pale buff band adjacent to orbit; ocellar protuberance, and a diagonal brown band anterolaterally from this to join a transverse band posterior to frons-clypeal suture, leaving pale triangular area (apex of triangle at anterior ocellus); striae over posterior half of postclypeus, leaving a pale narrow band medially; antenna; apical segment of maxillary palp; labrum. A dark brown band from orbit to antennal socket, ocelli with dark brown margins except anterior ocellus anteriorly. Eyes black.



Figures 85–89. *Ectopsocus rileyae*. Female: 85, forewing; 86, hindwing; 87, epiproct and paraprocts; 88, subgenital plate; 89, gonapophyses and spermathecal plate. Figures 85, 86 and 87–89 to common scales.



Figures 90–94. *Ectopsocus rileyae*. Male: 90, forewing; 91, epiproct, paraprocts and ninth tergite; 92, hypandrium; 93, phallosome; 94, phallosome (Tasmanian specimen). Figures 91–94 to common scale.

Gena, maxillary palp (except apical segment) and anterior half of postclypeus cream. Thoracic terga brown with buff margins adjacent to sutures, a broad brown band along side of cervicum and thorax. Legs, including coxae, very pale buff. Fore wing (fig. 85) membrane very pale brown, except hyaline in posterior marginal cells and costal cells; apices of veins extensively pigmented darker brown, *rs-m* junction with small brown cloud. Hind wing (fig. 86) hyaline. Abdomen with fairly broad grey-brown annulations.

Morphology. IO:D = 7.5. Epiproct (fig. 87).

Paraproct (fig. 87) with field of 7 trichobothria and a seta without rosette, duplex spines with associated seta as in *E. australis*. Subgenital plate (fig. 88) with subapical transverse row of 7 long setae on disc; apical lobes not separated from body of plate basally, short, broad, slightly curved towards midline, each with 3 apical setae, no projection between bases of inner pair of setae; plate with sclerotised band each side running into apical lobes and along posterior margin of plate. Gonapophyses (fig. 89): outer valve fairly straight, with 7 setae, valve small, little larger than dorsal valve (cf. *E. australis* above); dorsal valve subtriangular, apices finely spiculate; ventral valve broad compared to *E. australis*, inner margins spiculate. Spermathecal plate (fig. 89) lightly sclerotised with large unsclerotised area around gonopore.

Dimensions. B 2.1, FW 1.95, HW 1.55, F 0.49, T 0.75, t_1 0.213, t_2 0.087, rt 2.4:1, ct 12, 0, f_1 0.442, f_2 0.253.

Description of male. Coloration (after ca 3 yr in alcohol). As female with following exceptions: paler triangular area anterior to ocelli absent, posterior half of postclypeus darker brown, no median narrow stripe. Dark brown lateral stripe on thorax narrower, sclerites dorsal to this brown. Tibiae and tarsi slightly greyish. Dark pigment along apical sections of fore wing veins (fig. 90) much less obvious than in female.

Morphology. lO:D = 5.3. Epiproct (fig. 91) setose over apical third only. Paraproct (fig. 91) with field of 7 trichobothria and duplex spines separated almost to base, spines rather unequal in length. Ninth tergite (fig. 91) with prominent comb of single row of teeth. Eighth and ninth tergites without other ornamentation. Hypandrium (fig. 92) similar to *E. australis*. Phallosome (fig. 93): inner parameres fusing posteriorly into bicornate structure characteristic of this group of species but with crenulate posterior margin; at least 1 massive phallosome sclerite and 1 curved serrate sclerite; small conical projections half way along inner parameres [not seen on type preparation but illustrated (fig. 94) from another Tasmanian specimen].

Dimensions. B 1.7, FW 2.54, HW 1.98, F 0.50, T 0.85, t_1 0.253, t_2 0.091, rt 2.8:1, ct 15, 0, f_1 0.521, f_2 0.340.

Etymology. This species is named after Cathy Riley for her assistance during this project.

Remarks. Females of this species were collected from Wilsons Promontory, in tall open forest. Both sexes were found from Tasmania, thus these specimens were designated types.

Genitalic differences from other species in this group are tabulated in Table 3. *E. rileyae* is the only species of this group in which the male is known to lack ornamentation of the eighth tergite.

Peripsocidae Pearman

Peripsocus Hagen

Peripsocus Hagen, 1866: 203. Type species: *Psocus phaeopterus* Stephens.

Peripsocus bifasciatus sp. nov.

Figures 95–102

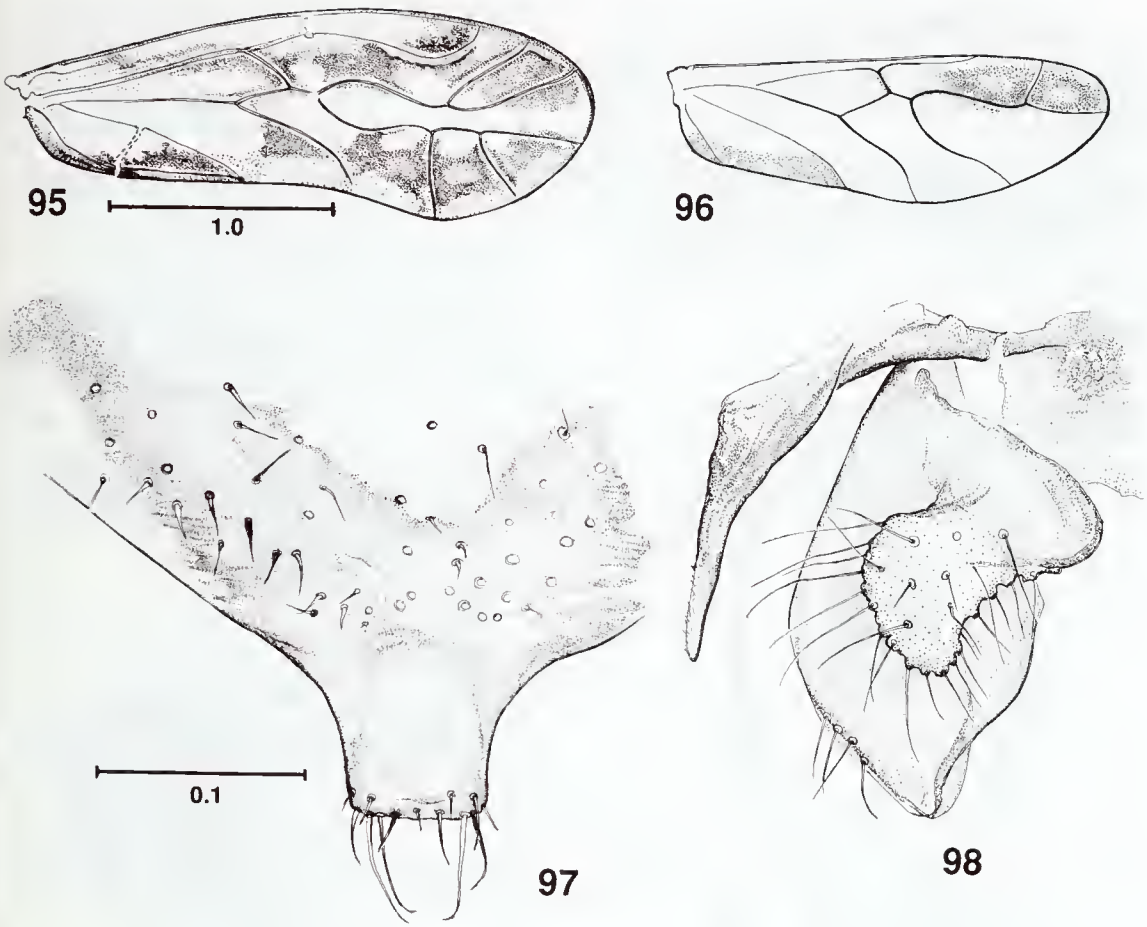
Material examined. Holotype ♀: Waterpump shed, *Melaleuca ericifolia*, 27–29 Mar 1985; allotype ♂: Lilly Pilly Nature Track, heath, 21–23 Apr 1985; 4 nymphs, 1 7♀ and 9♂ paratypes: same locality as holotype, 21–23 Feb 1986 (K73650–K73677). Additional records (32♀, 25♂, 10 nymphs): site 3 (May, Jun, Sep, Nov 1985, Jan 1986), site 4 (May, Jun, Aug, Sep, Oct, Nov, Dec 1985, Jan 1986), site 5 (Mar, Jun, Sep, Nov, Dec 1985, Jan 1986), site 8 (Sep, Oct 1985), site 9 (Nov, Dec 1985, Jan 1986), site 10 (Jan 1986), site 19, site 27, site 31, site 42.

Description of female. Coloration (after ca 5 yr in alcohol). Head generally buff, usual markings on vertex as brown spots. Eyes black. Antenna with scape, pedicel and f_1 pale buff, f_1 shading to light brown apically, rest of flagellum light brown. Ocellar protuberance with black rim, ocelli also with black surrounds. Immediately anterior to ocellar protuberance a brown spot slightly smaller than protuberance. Postclypeus with 6 regular V-shaped brown striae. Gena buff, unmarked. Anteclypeus buff, labrum dark brown. Maxillary palps pale buff, apical segment light brown apically. Dorsal lobes of thorax brown, bordered buff; mesothoracic antedorsum with median buff line separating brown pigment each side. Legs pale buff except coxa light brown, protibia brown in apical half, tarsal segments light brown. Fore wing patterned with brown pigment as in fig. 95, wing with 2 very irregular longitudinal brown bands. Hind wing with longitudinal brown band anteriorly (fig. 96).

Morphology. lO:D = 4.5. Epiproct broad, trapezoidal, setose. Paraproct with field of 19 trichobothria. Subgenital plate (fig. 97). Gonapophyses (fig. 98).

Dimensions. B 1.8, FW 2.48, HW 1.89, F 0.37, T 0.71, t_1 0.190, t_2 0.111, rt 1.7:1, ct 12, 0, f_1 0.324, f_2 0.245.

Description of male. Coloration (after ca 5 yr in alcohol). As female, except fore wing (fig. 99)



Figures 95–98. *Peripsocus bifasciatus*. Female: 95, forewing; 96, hindwing; 97, subgenital plate; 98, gonapophyses. Figures 95, 96 and 97 and 98 to common scales.

pattern less intense, no brown pigment along basal section of vein r_1, femur light brown.

Morphology. IO:D = 0.8. Hind wing (fig. 100). Epiproct (fig. 101). Paraproct (fig. 101) with field of 36 trichobothria. Ninth tergite (fig. 101) with projecting curved lobe bearing a row of pointed teeth, some smaller teeth anterior to this. Hypandrium (fig. 102) simple. Phallosome (fig. 102) with pair of tridentate sclerites and more apically a pair of rounded sclerites with pointed apices.

Dimensions. B 1.6, FW 2.71, HW 2.06, F 0.40, T 0.80, t_1 0.245, t_2 0.111, rt 2.2:1, ct 15, 0, f_1 0.419, f_2 0.352.

Remarks. This species is unique both in wing pattern and features of male and female genitalia. It was found predominantly in heathland and scrub, but also in open forest.

Peripsocus maoricus (Tillyard)

Peripsocopsis maoricus Tillyard, 1923: 194.
Peripsocus maoricus. — Roesler, 1944: 154.

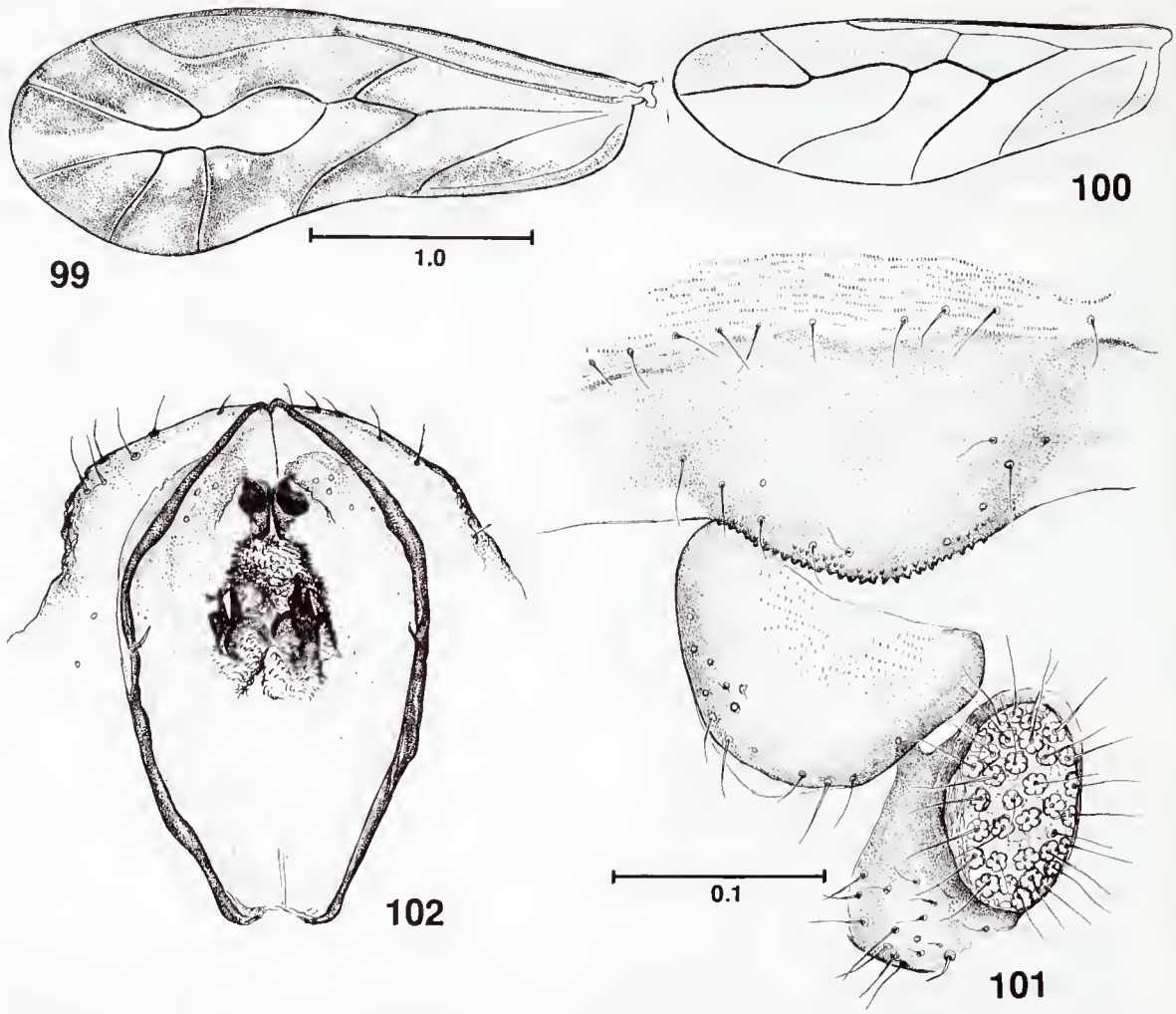
Material examined. 22♀, 12♂, 3 nymphs: site 3 (Feb 1986), site 9 (Mar, May, Jul, Sep, Oct, Dec 1985, Jan 1986), site 14 (Apr 1984), site 15 (Apr 1984), site 19, site 26, site 27, site 29, site 34, site 36, site 40.

Remarks. This species is widely distributed in southern Australia, and has been recorded previously from Wilsons Promontory. Found predominantly in low open forest (site 9) as well as heathland and *Melaleuca* scrub.

Peripsocus melaleucae New

Peripsocus melaleucae New, 1971: 224.

Material examined. 27♀, 5♂, 2 nymphs: site 9 (Jan 1986), site 14 (Apr 1984), site 20, site 36.



Figures 99–102. *Peripsocus bifasciatus*. Male: 99, forewing; 100, hindwing; 101, epiproct, paraproct and nith tergite; 102, phallosome and hypandrium. Figures 99, 100 and 101 and 102 to common scales.

Remarks. This species of heath and scrub has been recorded only from the Grampians, Victoria and the Bass Strait islands.

Peripsocus milleri (Tillyard)

Peripsocopsis milleri Tillyard, 1923: 195.
Peripsocus milleri. — Roesler, 1944: 154.

Material examined. 3♀, 2♂: site 7 (Feb 1986), site 8 (Jan 1991), site 14 (Apr 1984), site 19.

Remarks. P. milleri has previously been recorded from Wilsons Promontory. Its distribution is similar to that of *P. maoricus* but it is less common and has not yet been recorded from South Australia or the Bass Strait islands. In this survey it was found in tall open and closed forest.

Peripsocus tillyardi New

Figures 103–108

Peripsocus tillyardi New, 1973a: 343.

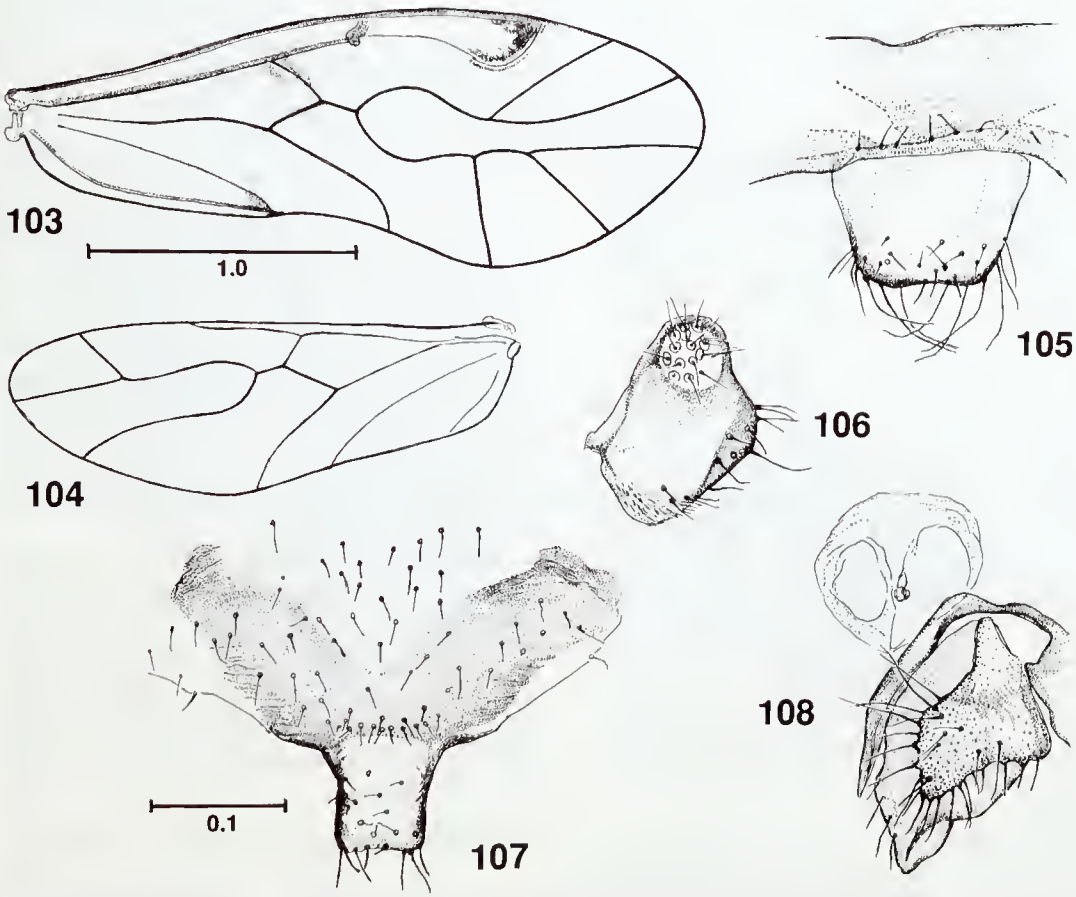
Material examined. Specimen on which description based: ♀, Lilly Pilly Nature Track 'The Loop', closed forest, 5–6 Jan 1986. Additional records (148♀, 74♂, 10 nymphs): site 2 (Feb 1986), site 3 (Feb, Mar, Nov, Dec 1985, Jan, Feb 1986), site 4 (Mar, Jun, Aug, Sep 1985, Jan, Feb 1986), site 5 (Apr, May, Jul, Sep, Dec 1985, Jan, Feb 1986), site 7 (May 1985), site 8 (Feb, Jun, Jul, Aug, Sep, Oct, Nov, Dec 1985, Jan 1986), site 9 (May, Jun, Jul, Aug, Sep, Oct, Nov, Dec 1985, Jan, Feb 1986, Jan 1991), site 10 (May, Jun, Jul, Aug, Sep, Oct, Nov, Dec 1985, Jan, Feb 1986), site 12, site 13, site 14 (Apr 1984, Apr 1990), site 19, site 21, site 22, site 24, site 25, site 26, site 27, site 28 (Apr 1990), site 29, site 31, site 32, site 37, site 39, site 42.

Description of female. Coloration (after ca 5 yr in alcohol). As male with following exceptions: vertex with areas of confluent brown patches along posterior margin, flanking epicranial suture, and mesad of orbits, leaving pale buff areas as follows each side: 1 just posterior to orbit, 2 in line parallel to epicranial suture, and 1 elongate area anterior to orbit. Maxillary palp with 2 apical segments very dark brown, remainder very pale buff. Fore wing pattern (fig. 103). Legs with coxa brown; basal third of femur pale buff, mid third brown, apical third pale buff; basal two-thirds of tibia pale greyish brown, apical third brown; tarsal segments brown. Abdomen dark greyish brown.

Morphology. IO:D = 2.8. Hind wing (fig. 104). Epiproct (fig. 105) squarish. Paraproct (fig. 106) with raised circular field of 14-16 trichobothria. Subgenital plate (fig. 107). Gonapophyses (fig. 108).

Dimensions. B 1.8, FW 2.54, HW 1.86, F 0.37, T 0.77, t_1 0.158, t_2 0.059, rt 2.7:1, et 16, 0, f_1 0.245, f_2 0.186.

Remarks. We provide a description of the female of this species, hitherto known only from the male. On re-examining the male holotype the femur was seen to be pale over the basal quarter, shading to brown over the middle half and abruptly changing to pale over the apical quarter; the tibia is pale in the basal half shading to brown in the apical half. Also known from the Grampians, NSW, Bass Strait islands and the Melbourne area, the species was found at Wilsons Promontory in almost all habitats sampled; it was not found in the *Banksia* or mangrove habitats.



Figures 103–108. *Peripsocus tillyardi*. Female: 103, forewing; 104, hindwing; 105, epiproct; 106, paraproct; 107, subgenital plate; 108, gonapophyses. Figures 103, 104 and 105–108 to common scales.

Pseudocaeciliidae Pearman

Austropsocus Smithers

Austropsocus Smithers, 1962: 930. Type species: *Austropsocus insularis* Smithers.

Austropsocus antennalis Thornton and New

Austropsocus antennalis Thornton and New, 1977: 24.

Material examined. 2♀, 6♂, 1 nymph: site 6 (Apr, May 1985), site 7 (Mar, May, Dec 1985), site 28 (Apr 1991 – off nearby dead *Eucalyptus* leaves).

Remarks. This species has previously been recorded from north Queensland, NSW and the Bass Strait islands. At Wilsons Promontory it was taken in bracken and in tall open forest.

Austropsocus cornutus sp. nov.

Figures 109–118

Material examined. Holotype ♂: Millers Landing, *Avicennia marina*, 17 Apr 1990; allotype ♀, 4 nymphs, 4♀, 4♂ paratypes: same data as holotype (K73678–K73687). Additional records (11♀, 6♂, 9 nymphs): site 28 (Apr 1991), site 33.

Description of female. Coloration (after ca 6 mo in alcohol). Body generally buff. Head pattern (fig. 109): adjacent brown spots dorsal to orbits across posterior of vertex and flanking medial epicranial suture, which is dark brown. Ocellar protuberance dark grey, ocelli pale with centripetal black margins, protuberance surrounded by granulated grey area which is broader anteriorly than posteriorly and in middle of frons takes the form of a heart shaped brown spot with granulated grey margins, the size of ocellar protuberance. Postclypeus with obvious striae converging anteriorly in V patterns, anteclypeus and labrum dark brown. Gena with a few dark spots below eye. Maxillary palp apical segment brown apically. Antenna: scape brown, pedicel pale brown, f_1 and f_2 pale buff, f_3 brown, f_4, f_5, f_6 dark brown, remainder of flagellum brown. Eyes black. Setae of head dark brown. Thorax with dark brown dorsal lobes, intermediate areas buff, pleura predominently brown. Legs pale, t_1 light brown, t_2, t_3 darker grey-brown. Fore wing (fig. 110) with brown pigment along veins. Hind wing (fig. 111) hyaline. Abdomen cream with broad grey-brown annulations.

Morphology. IO:D = 5.0. Antennae with long, stiff setae. Fore wing short compared to that of male. Vein setae in 2 ranks apically, basally in 3 ranks and of 2 lengths, some at least twice as long as others. Claw without subapical tooth. Epiproct (fig. 112) with prominent pattern of 7 long stiff setae, and shorter more slender setae, an extremely stout seta on a slightly raised area subapically. Paraproct (fig. 112) with round field of 12 trichobothria. Subgenital plate (fig. 113) bilobed, each lobe with row of 3 stout setae, apical margin with minute spicules; at base of apical sclerotised lobes a row of 3 and 4 long setae, more anteriorly 4 well-spaced extremely long setae. Gonapophyses (fig. 114): ventral valve spiculate, narrow, bluntly ended, evenly tapering; dorsal valve with subapical lobe extending almost to apex of spiculate apical tine; outer valve ovoid with scattered, very long setae.

Dimensions. B 3.0, FW 2.24, HW 1.80, F 0.63, T 0.94, t_1 0.221, t_2 0.071, t_3 0.071, rt 3.1:1:1, et 0, 0, 0, f_1 0.474, f_2 0.261.

Description of male. Coloration (after ca 6 mo in alcohol). As female with following exceptions: vertex without distinct pattern of brown patches, rather a brown uniform ground color where these patches occur in female; brown spots on gena below eye absent. Antennal colour: scape brown, pedicel and f_1 buff, f_2 light brown, rest of flagellum brown. Fore wing without brown pigment along veins (fig. 115).

Morphology. IO:D = 2.3. Fore wing longer than female, veins narrower. Hind wing as fig. 116. Epiproct trianguloid, setose. Paraproct with oval field of 17 trichobothria. Hypandrium structure (fig. 117) similar to that of *Austropsocus omega* Thornton and New, 1977, differing, however, in that median apical lobe is prolonged laterally into a sclerotised curved pointed tine. Phallosome penial bulb sclerites (fig. 118) as those of *A. omega*, and in addition a basal pair of narrow curved sclerites.

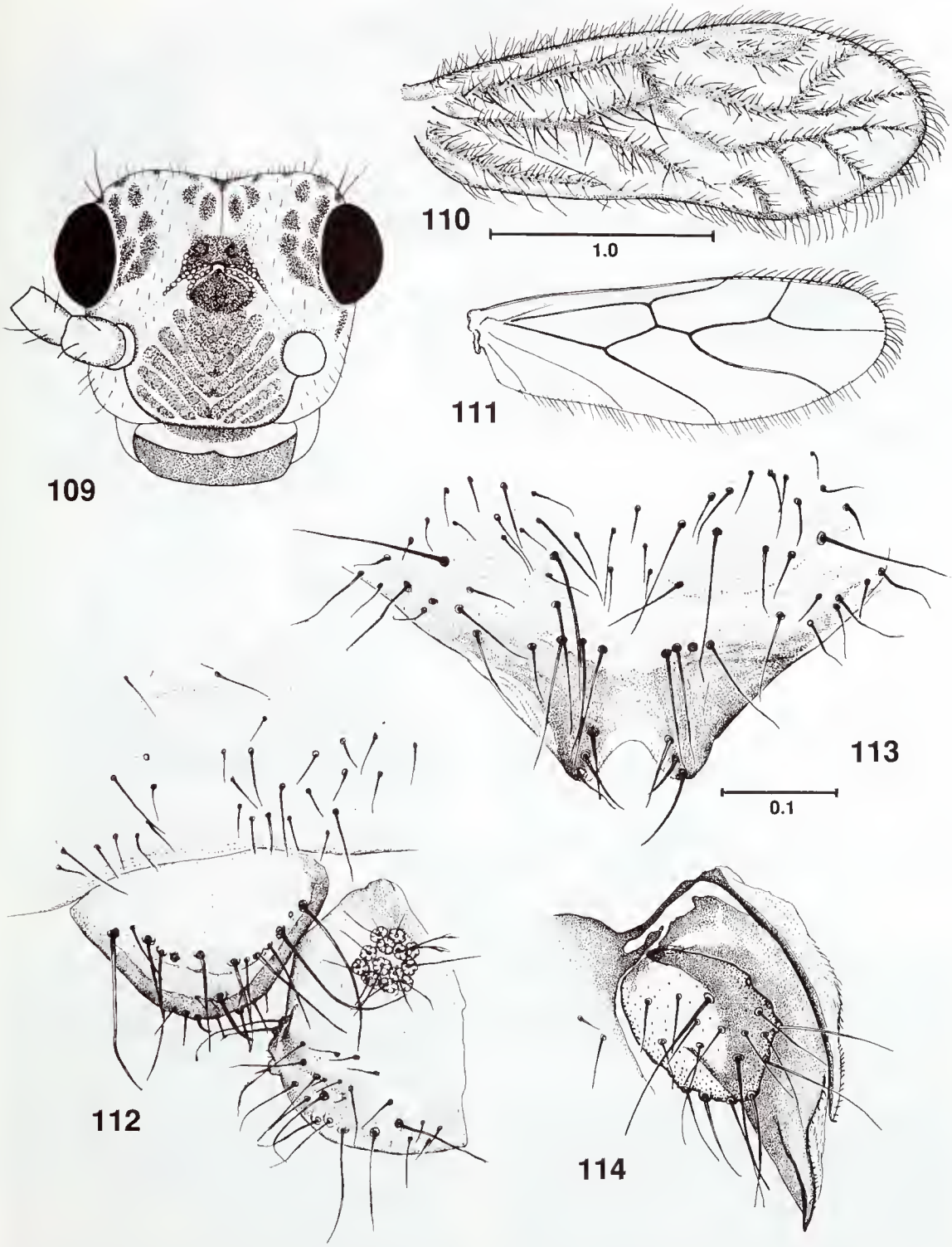
Dimensions. B 2.6, FW 3.51, HW 2.79, F 0.69, T 1.11, t_1 0.237, t_2 0.071, t_3 0.079, rt 3.3:1:1.1, et 10, 0, 0, f_1 0.826, f_2 0.547.

Remarks. Austropsocus cornutus, found in mangroves and closed forest, keys to couplet 9 in the key of Thornton and New (1977). In the fore wing vein *rs* is only slightly curved and bears setae in 3 ranks. This sexually dimorphic species may be distinguished on head pattern and features of male genitalia; the lateral horn-shaped prolongations of the median lobe of the hypandrium are unique.

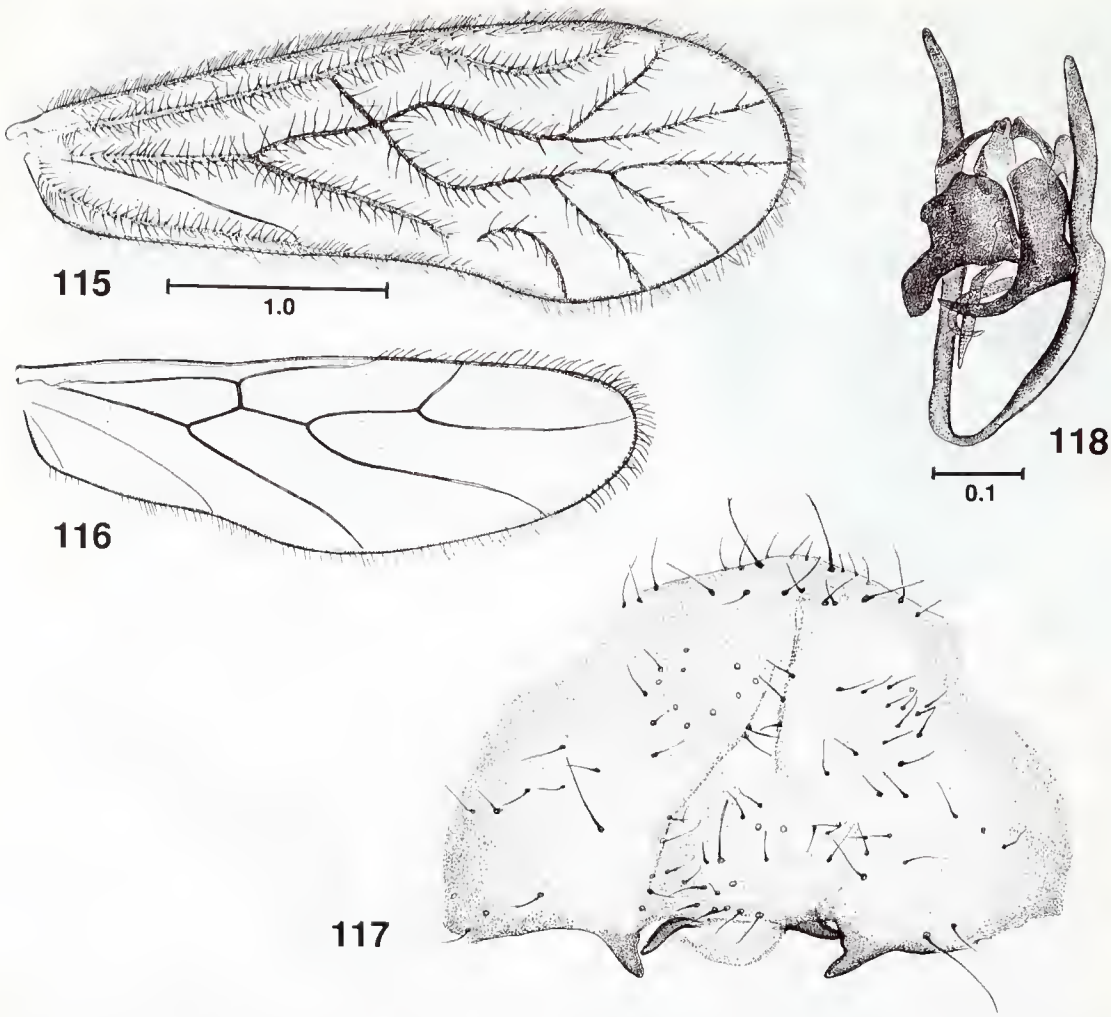
Austropsocus costalis Thornton and New

Figures 119–122

Austropsocus costalis Thornton and New, 1977: 36.



Figures 109–114. *Austropsocus cornutus*. Female; 109, head pattern; 110, forewing; 111, hindwing; 112, epiproct and paraproct; 113, subgenital plate; 114 gonapophyses. Figure 109 not to scale. Figures 110, 111 and 112–114 to common scales.



Figures 115–118. *Austropsocus cornutus*. Male: 115, forewing; 116, hindwing; 117, hypandrium; 118, phallosome. Figures 115, 116 and 117 and 118 to common scales.

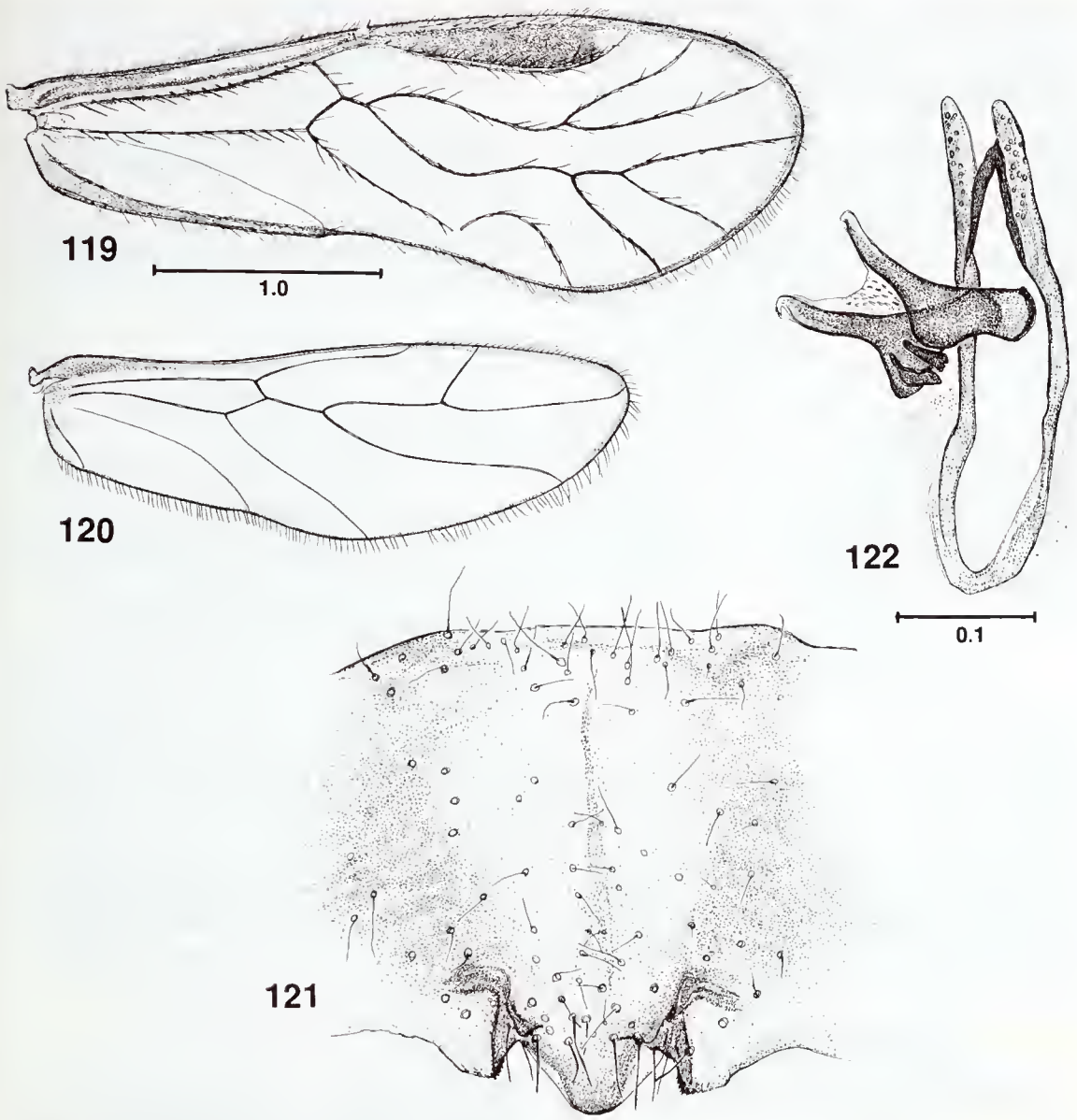
Material examined. Specimen on which description based: ♂, Lilly Pilly Nature Track, low open forest, 11–13 Aug 1985. Specimen on which dimensions of ♀ based: ♀, locality as ♂, 8–10 Sep 1985. Additional records (5♀, 4♂): site 2 (Sep, Oct 1985, Jan 1986), site 9 (Nov 1985, Jan 1986), site 44.

Description of male. Coloration (after ca 5 yr in alcohol). As female, with following exceptions: maxillary palps dark brown, basal flagellar segment slightly paler than more apical segments, except towards distal end.

Morphology. IO:D = 2.1. Generally as female, with following exceptions: length of flagellar setae > 3 times width of basal flagellar segment. Epiproct rounded trianguloid with sparse short setae and 2 longer setae at margin on each side. Paraproct with oval field of 20 trichobothria and 2 setae within field not with rosette sockets. Fore wing as fig. 119; hind wing as fig. 120. Hypandrium (fig. 121) 5-lobed, the pair of lobes adjacent to the central lobe very small and sclerotised, outer pair of lobes of characteristic shape and finely serrate. Phallosome (fig. 122) with pair of large distinctively-shaped sclerites, and pair of small wedge-shaped pointed sclerites.

Dimensions. B 1.9, FW 3.45, HW 2.65, F 0.52, T 1.08, t_1 0.392, t_2 0.071, t_3 0.079, rt 5.5:1:1.1, ct 21, 0, 0, f_1 0.64, f_2 0.379.

Further description of female. Dimensions (see remarks below). F 0.46, T 0.91, t_1 0.292, t_2 0.071, t_3 0.071, rt 4.1:1:1, ct 15, 0, 0, f_1 0.450, f_2 0.276.



Figures 119–122. *Austropsocus costalis*. Male: 119, forewing; 120, hindwing; 121, hypandrium; 122, phallosome. Figures 119, 120 and 121 and 122 to common scales.

Remarks. We provide a description of the male of this species, previously known only from the female. In this survey *A. costalis* was found in low open forest (site 9) and eucalypt woodland (site 2), as well as coastal vegetation.

Described from a single Queensland female found high on the Atherton Tablelands, the discovery of both sexes of this species at the southern extremity of continental Australia (and on the Bass Strait islands) is of interest. Examination of the Wilsons Promontory specimens shows that the connection between *rs* and *m* of the fore wing is variable. The type female lacked antennae and hind legs; we therefore provide dimensions of these body parts from one of our females.

Thornton and New (1977) separated *costalis*, along with six other Australian species having only two setae on the subgenital plate and a 2- or 4-lobed hypandrium, from a group of four Aus-

tralian species having five or more apical setae on the female subgenital plate and a 5-lobed hypandrium. Our discovery of the male and examination of its genitalia shows that *costalis* does not fall into either of these two groups. Its female subgenital plate has but two apical setae and the hypandrium is 5-lobed. In hypandrial structure and phallosome sclerites it is most similar to *Austropsocus baeus* Thornton and Smithers from New Caledonia, of which the female is unknown, and, like the other New Caledonian species in which the male is known, the phallosome lacks the pair of spinous sacs present in some New Zealand species. The five New Caledonian species of which the female is known have a very long subapical spine on the dorsal valve of the gonapophyses, and in this feature they differ from females of all Australian and New Zealand species of the genus, except *Austropsocus hyalinus* Thornton, Wong and Smithers and *A. costalis*. Significantly, the range of both these species extends to north Queensland.

Austropsocus hyalinus
Thornton, Wong and Smithers

Austropsocus hyalinus Thornton, Wong and Smithers, 1977: 219.

Material examined. 37♀, 14 nymphs: site 7 (Jan 1986), site 8 (Mar, Apr, May, Aug, Sep, Oct, Dec 1985, Jan 1986, Jan 1991), site 28 (Apr 1990), site 38, site 39.

Remarks. This species of closed forest (site 8), previously recorded from north Queensland, NSW, Victoria and the Bass Strait islands, was originally described from New Zealand. Only females have been collected from Wilsons Promontory.

Austropsocus sinuosus (Banks)

Zelandopsocus sinuosus Banks, 1939: 441.
Austropsocus sinuosus. — Thornton and New, 1977: 28.

Material examined. 2♀: site 7 (Apr 1985), site 19.

Remarks. A widespread species found in all eastern mainland states, Tasmania, the Bass Strait islands and South Australia. Found only in one habitat in this survey: tall open forest.

Austropsocus tibialis Thornton and New

Austropsocus tibialis Thornton and New, 1977: 30.

Material examined. 14♀, 2♂: site 28 (Apr 1990, Apr 1991), site 38.

Remarks. A common species recorded from eastern Australian from the Bass Strait islands to north Queensland, it was found here at two sampling sites of closed forest.

Austropsocus viridis (Enderlein)

Philotarsus viridis Enderlein, 1903: 309.
Austropsocus viridis. — Thornton and New, 1977: 32.

Material examined. 104♀, 12♂, 35 nymphs: site 8 (Nov, Dec 1985, Jan 1986), site 11 (Apr 1984, Mar, Jun, Jul, Aug, Sep, Oct, Nov, Dec 1985, Jan, Feb 1986), site 25, site 28 (Apr 1990, Apr 1991), site 38, site 43.

Remarks. A. viridis has been collected from Victoria to north Queensland in eastern Australia. In this survey it was found predominantly on *Banksia serrata* (site 11) and in closed forest (site 8).

Cladioneura Enderlein

Cladioneura Enderlein, 1906: 404. Type species: *Cladioneura pulchripennis* Enderlein.

Cladioneura pulchripennis Enderlein
Cladioneura pulchripennis Enderlein, 1906: 405.

Material examined. 19♀, 19♂, 9 nymphs: site 2 (Nov 1985), site 3 (May 1985, Jan 1986 – nymph only), site 4 (Sep, Nov 1985, Jan 1986 – nymphs only), site 5 (Apr, Jul, Sep, Oct, Nov 1985, Jan 1986), site 6 (May, Jun 1985), site 8 (Sep, Oct, Nov 1985, Feb 1986), site 9 (Apr, Jul, Aug, Sep, Oct, Dec 1985, Jan, Feb 1986), site 10 (Aug 1985), site 27 (nymphs only), site 38, site 44.

Remarks. This species is known from NSW, Victoria, and the Bass Strait islands. It was collected in a variety of scrub and heathland sampling sites, as well as closed and low open forest.

Collective group "Heterocaecilius"
Lee and Thornton

Heterocaecilius Lee and Thornton, 1967: 13. No type species designated.

Remarks. Because no type species has ever been designated for this name it has no status as a genus (ICZN Article 42 (b) i). It is therefore to be treated as a "collective group", erected as a holding group to contain species of the family unassignable to any of the nominate genera.

"Heterocaecilius" brunellus (Tillyard)

Caecilius brunellus Tillyard, 1923: 188.
Pseudocaecilius brunellus. — Lee and Thornton, 1967: 111.
Heterocaecilius brunellus. — New, 1974a: 69.

Material examined. 43♀, 23♂, 16 nymphs: site 3 (Mar, Nov, Dec 1985, Jan, Feb 1986), site 4 (Jan, Sep, Oct 1985, Jan, Feb 1986 – nymph only), site 5 (Jan, Mar,

Apr, May, Jun, Sep, Oct, Nov, Dec 1985, Jan 1986), site 7 (Jan 1985), site 9 (Mar, May 1985, Jan, Feb 1986 – nymph only), site 14 (Apr 1984, Apr 1990, Jan 1991), site 17 (Jan 1985), site 18, site 20, site 25, site 26, site 29, site 30, site 38, site 42.

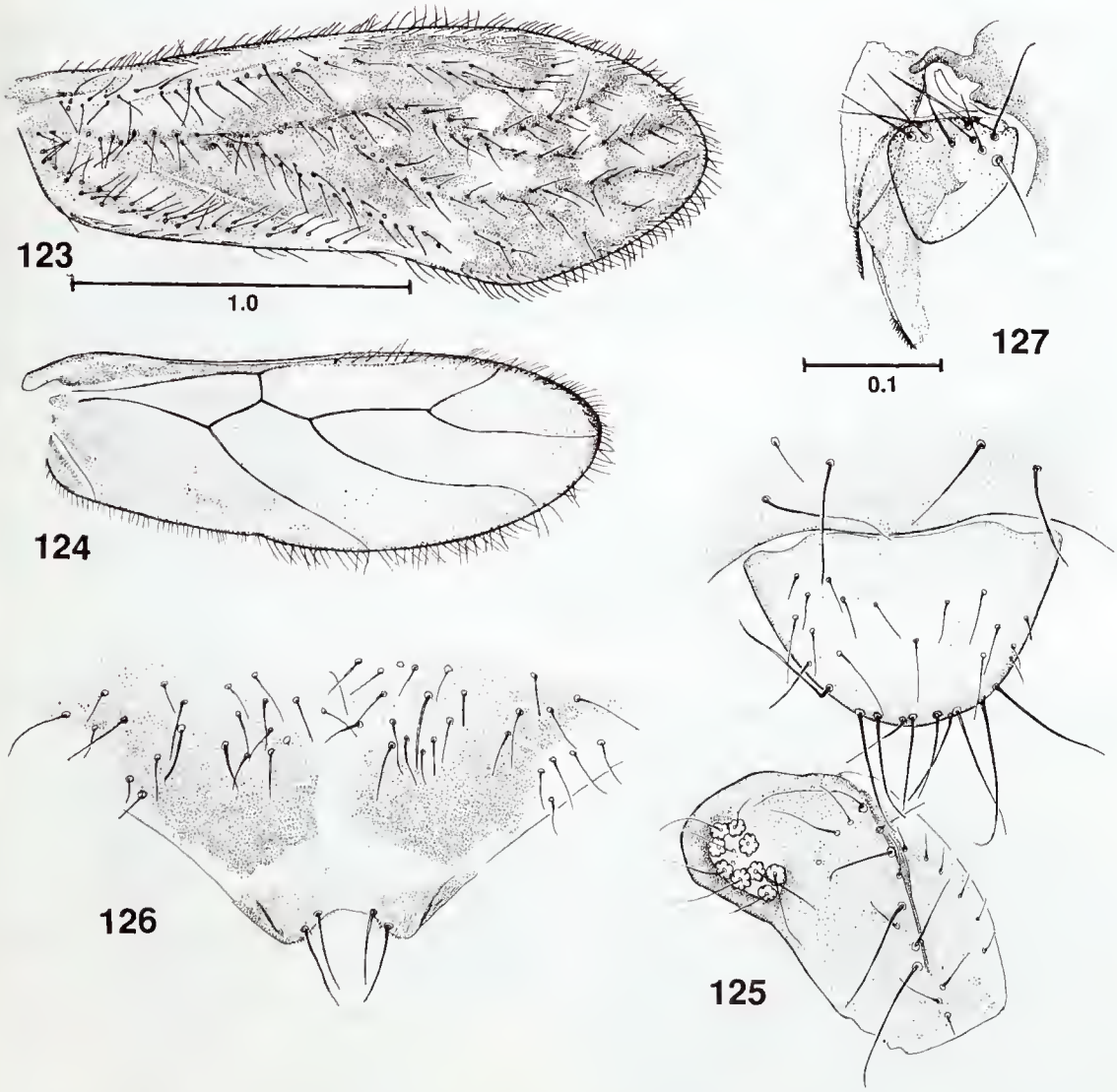
Remarks. This species, originally described from New Zealand, has been recorded from Tasmania, the Bass Strait islands, Victoria and NSW. At Wilsons Promontory it appears to be a species of heath and scrub vegetation, but also occurs in closed (site 8) and open (sites 7 and 9) forest.

"Heterocaecilius" lachlani (Enderlein)

Figures 123–132

Pseudocaecilius lachlani Enderlein, 1903: 263.

Material examined. Specimens on which descriptions based: ♀, Telegraph Saddle, low eucalypt woodland, 27–29 Mar 1985; ♂, Millers Landing Track, *Banksia serrata*, 21–23 Feb 1986. Additional records (11♀, 13♂, 8 nymphs): site 2 (Apr, Nov 1985, Jan, Feb 1986), site 4 (Sep, Oct 1985), site 5 (Apr 1985), site 9 (Nov 1985), site 11 (Feb 1986), site 13, site 14 (Apr 1984, Apr 1990), site 15 (Jan 1985), site 18.



Figures 123–127. *Heterocaecilius lachlani*. Female: 123, forewing; 124, hindwing; 125, epiproct and paraproct; 126, subgenital plate; 127, gonapophyses. Figures 123, 124 and 125–127 to common scales.

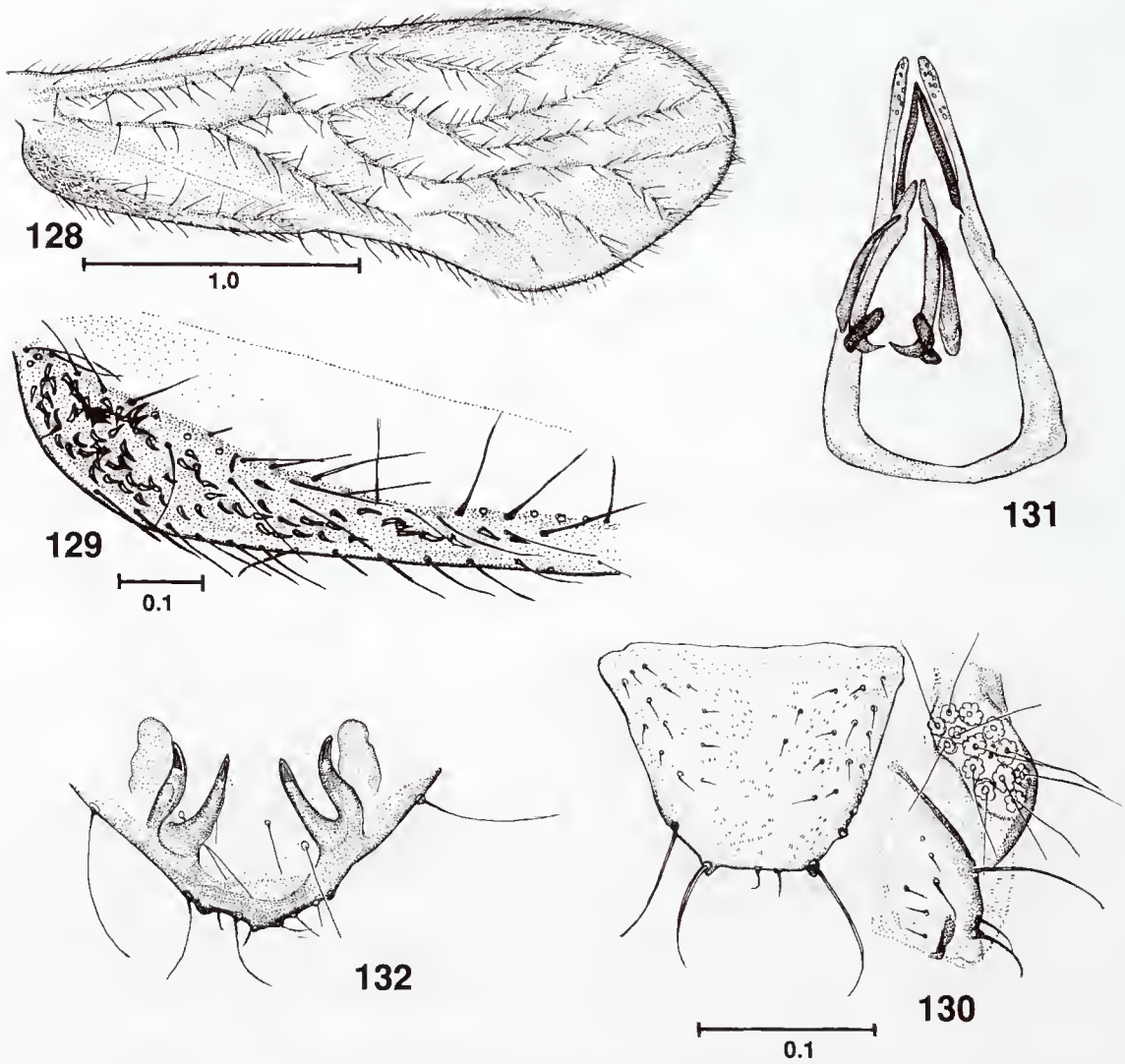
Description of female. Coloration (after ca 5 yr in alcohol). As Enderlein's description of male with following exceptions: head with distinct pattern, ground color pale buff, dark brown markings beside black epicranial suture and around orbits, postclypeus brown. Antenna light brown.

Morphology. IO:D = 6.0. Fore wing, fig. 123; hing wing fig. 124. Epiproct (fig. 125) simple, semi-circular, sclerotised near posterior margin, setose, setae on sclerotised portion longer than rest. Paraproct (fig. 125) with oval field of 9(10) trichobothria, and 1(2) setae not in rosette socket. Subgenital plate, fig. 126. Gonapophyses (fig. 127): both dorsal and ventral valves with distinct style and lobe, lobe of dorsal valve almost reaching apex of style.

Dimensions. B 1.6, FW 2.02, HW 1.62, F 0.46, T 0.85, t_1 0.261, t_2 0.107, rt 2.4:1, ct 13, 0, f_1 = 0.292, f_2 = 0.167.

Further description of male. Coloration (after ca 5 yr in alcohol). Much lighter than as described by Enderlein, body and wings lighter than female.

Morphology. IO:D = 1.5. Fore wing (fig. 128) longer than in female, a field of sensory (?) short curved sharply pointed papillae in anal cell (fig.



Figures 128–132. *Heterocaecilius lachlani*. Male: 128, forewing; 129, enlargement of anal cell of forewing; 130, epiproct and paraproct; 131, phallosome; 132, hypandrium. Figures 130–132 to common scale.

129). Epiproct (fig. 130) angular, hexagonal, outer edge sclerotised, straight posteriorly; at each of the 4 posterior angles a long stout seta, at least 4 times as long and thiek as setae on surfaee of plate; a pair of short setae in middle of posterior margin; a field of pairs of small spicules adjaeent to posterior margin. Paraproct (fig. 130) with field of 12(13) trichobothria and 1 seta not in rosette. Phallosome (fig. 131) with 3 pairs of rod-like radular selerites, the longest stout, straight and bluntly pointed, 1 pair curved, narrower, slightly shorter and sharply pointed, and 1 pair very short, apparently twisted. Hypandrium (fig. 132) with 2 pairs of smoothly curved narrow projeetions with 'finger-nail' selerites; a pair of smoothly rounded lobes laterally each side.

Dimensions. B 1.4, FW 2.57, HW 2.00, F 0.47, T 0.90, t_1 0.296, t_2 0.111, rt 2.7:1, ct 14, 0, f_1 0.446, f_2 0.30.

Remarks. Found in low eucalpyt woodland, scrub, and *Banksia*. Enderlein described only the male of this dimorphie speeies without referenee to the genitalia. Smithers (1977) recorded both sexes at Muogamarra without further comment. We have dissected both sexes and provide a further description from specimens taken at Wilsons Promontory.

On eharacteristics of both male and female genitalia this species should not be placed in *Pseudocaecilius* Enderlein. Like another Australian speeies, *Caecilius brunellus* Tillyard, the hypandrium has pairs of posterior selerotised 'finger-nail' projeetions, the phallosome has rod-like sclerites and the subgenital plate is bilobed, with each lobe being subtriangular bearing a subapical and mesial basal seta. The presence of radular sclerites and the form of the subgenital plate suggest plaeement of this species in Lee and Thornton's collective group, rather than in *Lobocaecilius* Lee and Thornton. However, like *C. brunellus*, it resembles *Lobocaecilius* species in the 'finger-nail' sclerites of the hypandrium, the field of tubercles on the male epiproct and papillae of the male fore wing. Lee and Thornton (1967) suggested that *C. brunellus* (under the name *diogenes*) was intermediate between *Lobocaecilius* and the *greenwoodi* section of "Heteroeaecilius". On balance, *P. lachlani* is more similar to these than to other genera and is therefore part of this group.

Pseudoscottiella Badonnel

Pseudoscottiella Badonnel, 1946: 170. Type speeies: *Pseudoscottiella megops* Badonnel.

Pseudoscottiella papillosa sp. nov.

Figures 133–137

Material examined. Holotype ♀ : Lilly Pilly Nature Track, tall open forest, 15–16 Dec 1985 (K73688).

Description of female. Coloration (after ea 5 yr in alcohol). Body whitish-cream with the following exceptions: eyes blaek, thoracic nota pale brown, claws brown. Fore wing (fig. 133) hyaline, veins pale. Hind wing (fig. 134) hyaline.

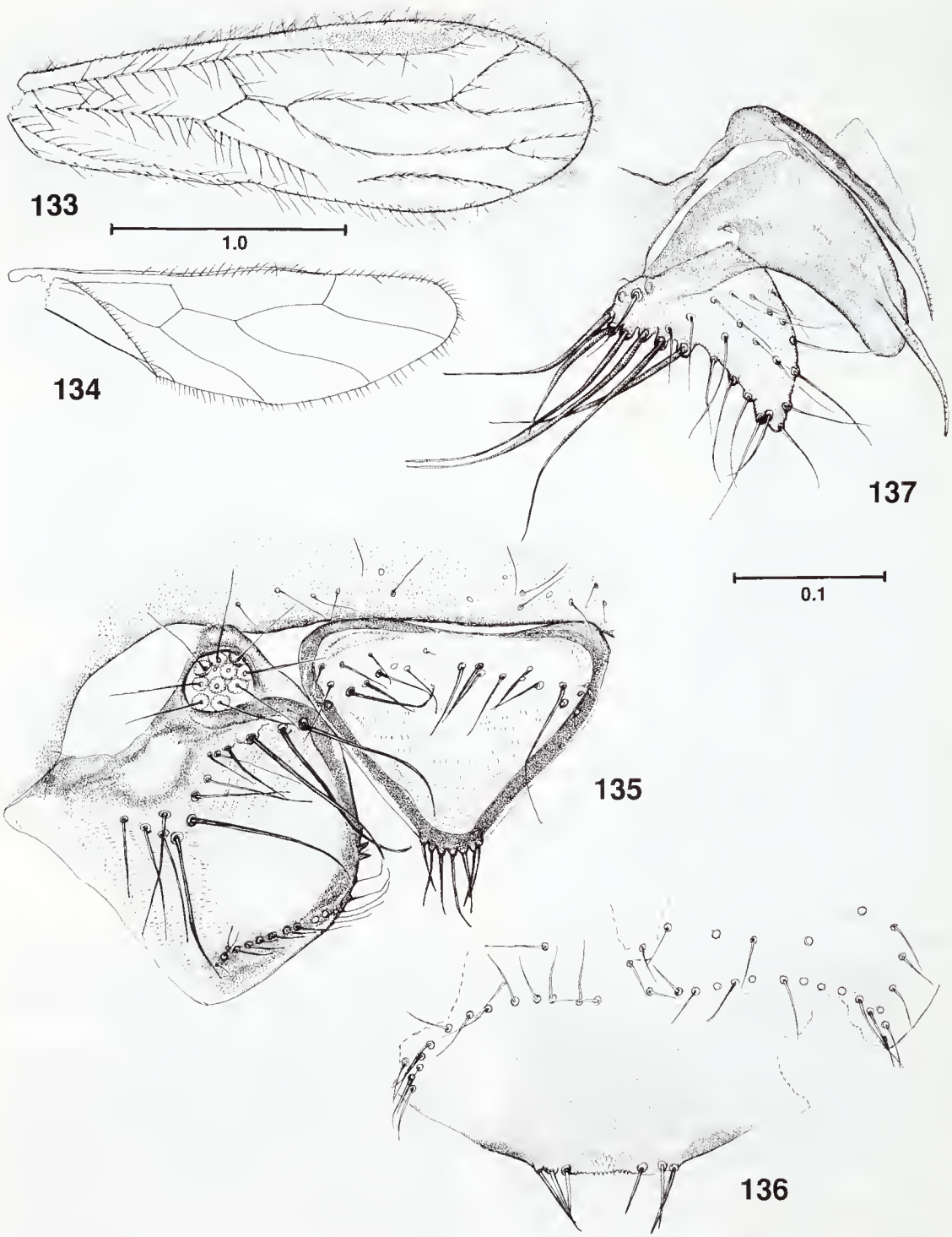
Morphology. IO:D = 6.0. Oeelli not obvious. Claw sharply recurved, without tooth. Epiproct (fig. 135) trianguloid, lateral and posterior edges thickened, highly sclerotised, with apical row of 7 setae, middle seta one-third longer than others, and a sub-basal transverse tract of setae, 1 very long seta at each end of this tract. Paraproct (fig. 135) with mesial border thickened, trichobothrial field eircular with 10 trichobothria; mesial margin with a double cone and a small seta adjacent to this anteriorly, posterior to cone a long curved row of setae. Subgenital platc (fig. 136): 3 stout setae at each posterior angle, between these a field of fine spicules extending in midline anteriorly less than half width of field. Gonapophyses (fig. 137): external valve with row of 4–6 very long stout setae on raised papillae near base of valve, face of valve setose; dorsal valve with very long finely and sparsely papillose apical spine, subapical lobe extending half way along spine; spine of ventral valve with sparse recurved setules.

Dimensions. B 1.9, FW 2.39, HW 1.71, F 0.50, T 0.77, t_1 0.538, t_1 0.230, rt 2.3:1, ct 10, 0, f_1 0.261, f_2 0.186.

Male. Unknown.

Remarks. One of us (ERS) has taken a female of this speeies from the high tablelands of north Queensland. We have treated and stained the head capsule of this specimen, confirming the presence of ocelli.

Pseudoscottiella watti Smithers from the Kermadec Islands, which is very close to *P. papillosa* in eolour of body, wings and venation (presenee of ocelli not mentioned), is the only other species in which the outer valve of the female gonapophyses carries a row of very long setae sited on raised papillae. *P. papillosa* differs from *P. watti*, however, in the arrangement and size of setae near to the triehobothrial field of the paraproct, the shape and extent of the median field of spicules on the subgenital plate, and the chaetotaxy of the basal half of the epiproet.



Figures 133–137. *Pseudoscottiella papillosa*. Female: 133, forewing; 134, hindwing; 135, epiproct and paraproct; 136, subgenital plate; 137, gonapophyses. Figures 133, 134 and 135–137 to common scales.

Pseudoscottiella rotundata New

Figures 138–141

Pseudoscottiella rotundata New, 1974a: 67.

Material examined. Specimen on which description based: ♂, Lilly Pilly Nature Track, low open forest, 1–3 Nov 1985. Additional records (11♀, 6♂, 2 nymphs): site 17 (Jan 1985), site 19, site 25, site 28 (Apr 1990), site 38, site 39.

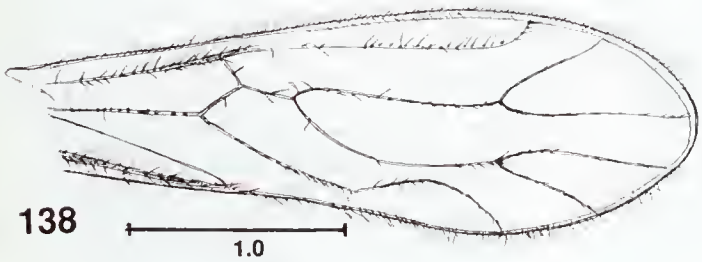
Description of male. Coloration (after ca 5 yr in alcohol). As female with following exceptions: head anteriorly cream, no discernible marks apart from antennal-orbit and post-orbital brown stripes. Brown pigment on mesothoracic terga rather paler than that on metathorax. Apical half of areola postica in fore wing (fig. 138) no different from rest of membrane; veins *rs* and r_{4+5} as dark as veins r_{2+3} and *m*.

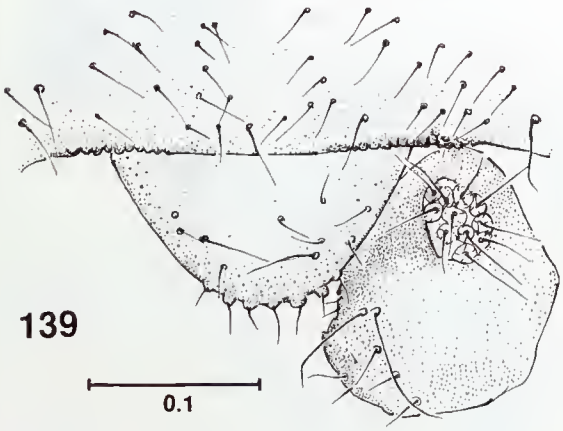
Morphology. IO:D = 2.7. Fore wing as fig. 138. Posterior border of ninth tergite with lateral rugose areas (fig. 139). Epiproct (fig. 139) semicircular, a row of 7 prominent setae on raised bosses along posterior margin, no apical field of papillae. Paraproct (fig. 139) with an oval field of 11 trichobothria. Hypandrium as fig. 140. Phallosome (fig. 141) angular with a pair of sclerotised rods, serrate on their inner faces over the fourth fifth of their length (from base to apex), projecting well beyond aedeagal arch to tip of outer parameres; penial bulb triangular, spiculate, most heavily along lateral margins.

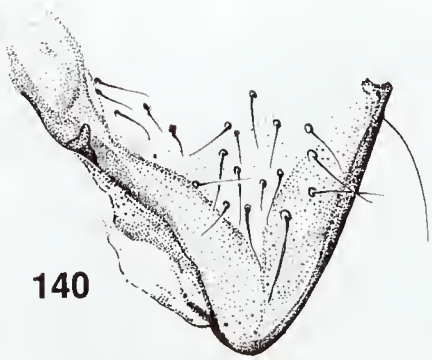
Dimensions. B 1.8, FW 3.12, HW 2.33, F 0.54, T 0.94, t_1 0.261, t_2 0.111, rt 4:1, ct 14, 0, f_1 0.529, f_2 0.308.

Remarks. New described this species from two females from Victoria, Australia. We here provide a description of a male from Wilsons Promontory.

The male of *P. rotundata*, like the female, is very similar to *P. crenulata* New, also known







Figures 138–141. *Pseudoscottiella rotundata.* Male: 138, forewing; 139, epiproct and paraproct; 140, hypandrium; 141, phallosome. Figures 139–141 to common scale.

from Victoria, although we have noted sexual dimorphism in coloration, whereas New noted no differences between the sexes of *P. crenulata.* In all female specimens of *P. rotundata* that we have examined (from Wilsons Promontory and elsewhere in Victoria) vein *rs* in the fore wing is paler than r_{2+3} and the medial branches, although this is not noted in New's description.

Pseudoscottiella tanei Smithers

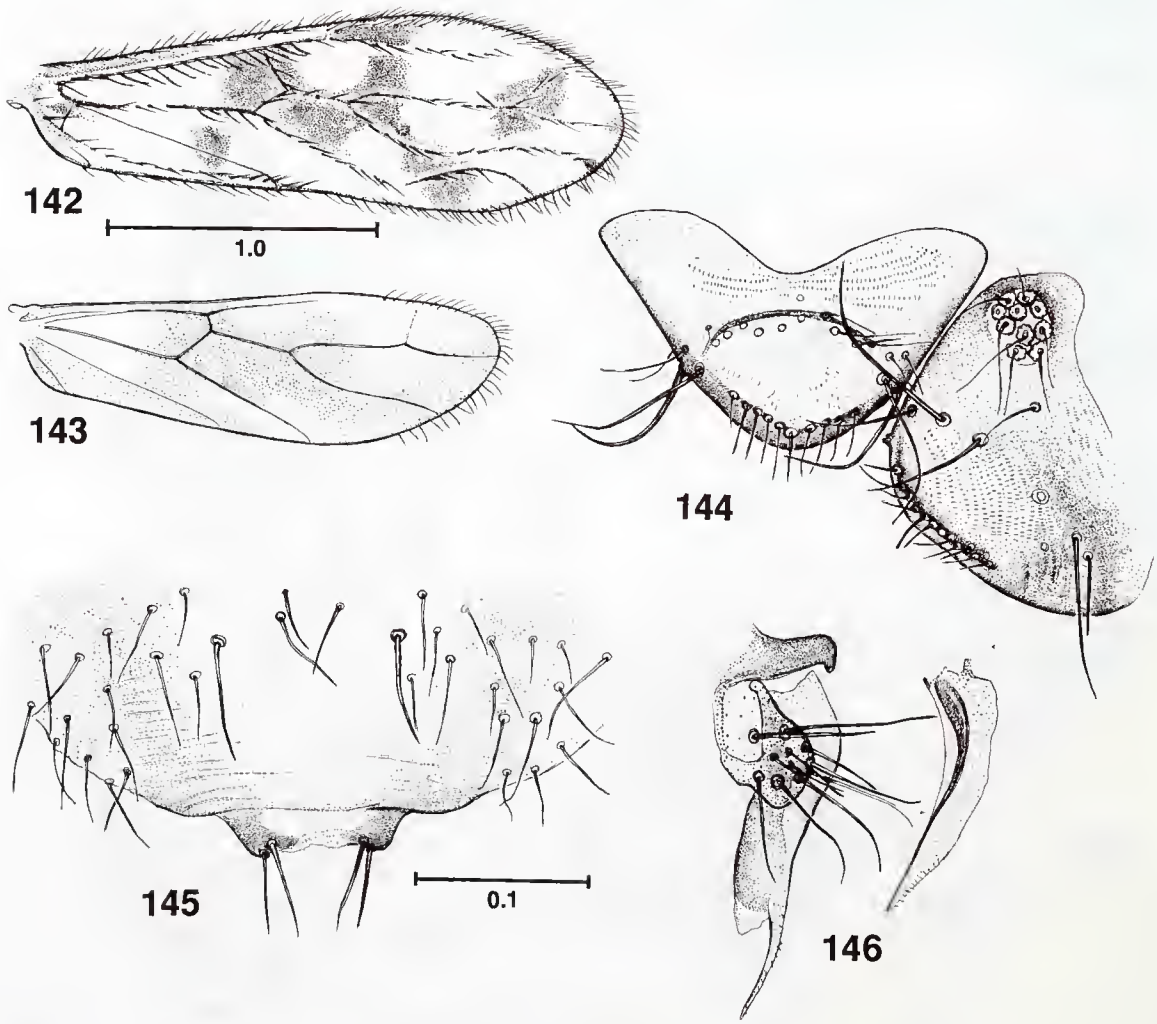
Figures 142–146

Pseudoscottiella tanei Smithers, 1977: 279.

Material examined. Specimen on which description based: ♀, Lilly Pilly Nature Track, tall open forest, 26–27 Jan 1986. Additional records (7♀, 13♂, 2 nymphs): site 7 (Nov, Dec 1985, Jan 1986), site 8 (Nov 1985, Jan 1986), site 10 (Mar 1985), site 28 (Apr 1990, Apr 1991), site 32, site 38.

Description of female. Coloration (after ca 5 years in alcohol). As male with the following exceptions: vertex cream with brown markings flanking orbit and epicranial suture. Ocelli centripetally black, antenna with scape and apical 4 segments of flagellum brown, otherwise very pale buff. Legs wholly pale cream except extreme basal margin of coxae. Fore wing (fig. 142) with brown mark in cell *M+Cu* not extending anteriorly to cell margin. Hind wing (fig. 143) with faint brown pattern. Abdomen dark grey-brown.

Morphology. lO:D = 5.8. Generally as male, antenna strongly setose. Epiproct (fig. 144) with



Figures 142–146. *Pseudoscottiella tanei.* Female: 142, forewing; 143, hindwing; 144, epiproct and paraproct; 145, subgenital plate; 146, gonapophyses. Figures 142, 143 and 144- -146 to common scales.

distinctive pattern of ciliation. Paraproct (fig. 144) with oval field of 10 trichobothria. Subgenital plate (fig. 145) with broad shallow apical lobe, itself incipiently bilobed, with a pair of stout setae each side of distal margin, lateral areas of lobe sclerotised. Gonapophyses (fig. 146): dorsal valve with short subapical lobe; outer valve small, rounded, heavily setose.

Dimensions. B 2.1, FW 2.12, HW 1.70, F 0.44, T 0.69, t_1 0.166, t_2 0.087, rt 1.9:1, ct 9, 0, f_1 0.269, f_2 0.182.

Remarks. This species was hitherto known only from a single male. We here provide a description of the female.

Found at Wilsons Promontory in tall open (site 7) and closed (site 8) forest as well as coastal vegetation. Discovery of females of this species, which can be clearly associated with males satisfying the description of Smithers (1977), shows this species to be sexually dimorphic in head pattern, antennal coloration and in small features of fore wing pattern, particularly the continuous hyaline area posterior to vein *m+cu*. In female genitalia *P. tanei* closely resembles *P. yenoides* (below). *P. yenoides* and *P. yeni* New are the only other two species of this genus known from continental Australia with patterned wings; although the pattern is similar to that of *P. tanei* in general features, in neither of these species does the pigment pattern extend to cell R_3. Macropterous and brachypterous females have been collected.

Pseudoscottiella yenoides sp. nov.

Figures 147–157

Material examined. Holotype ♀: Mt Sugarloaf, *Acacia melanoxylon* Kinglake National Park, Victoria, 30 Apr 1989; allotype ♂, 2♀ and 1♂ paratypes: same data as holotype (K73689–K73693). Additional records (1♀): site 17 (Jan 1985).

Description of female. Coloration (after ca 1 year in alcohol). Head creamy-buff with following exceptions: eyes black; pattern of brown spots flanking each orbit on vertex, pale brown along posterior of vertex; frons postclypeus, labrum and gena brown; ocelli without brown annuli. Apical half of flagellum pale brown. Thorax with dark brown dorsa having wide cream interpigmental areas. Thorax laterally and ventrally brown. Legs cream, t_2 dark brown apically. Fore wing (fig. 147) with distinct dark brown pigment pattern, anal cell hyaline. Hind wing (fig. 148) with pale brown pigment in basal cells, including cell *M*; cells R_1, R_3 and R_5 hyaline. Abdomen cream, genital segments dark.

Morphology. IO:D = 5.2. Claw without apical tooth. Epiproct (fig. 149) with median transverse row of setae, preapical row of shorter setae; apical margin thickened. Paraproct (fig. 149) with oval field of 10 trichobothria, single divided hyaline cone on inner apical border. Subgenital plate (fig. 150) slightly bilobed apically, sub-lobes with 2 and 3 stiff setae; area between sub-lobes spiculate. Gonapophyses (fig. 151, ventral valve broken and attached to subgenital plate) with outer valve ovoid bearing 8–9 setae, some very long; dorsal valve with short subapical lobe and spiculate apical tine.

Dimensions. B 2.45, FW 2.42, HW damaged, F 0.48, T 0.76, t_1 0.182, t_2 0.095, rt 1.9:1, ct 10, 0, f_1 0.324, f_2 0.186.

Description of male. Coloration (after ca 1 yr in alcohol). As female with following exceptions: ocelli with dark brown margins, epicranial suture dark brown, antenna brown. Coxae of meso- and metathoracic legs brown basally. Fore wing (fig. 152) and hind wing (fig. 153) hyaline.

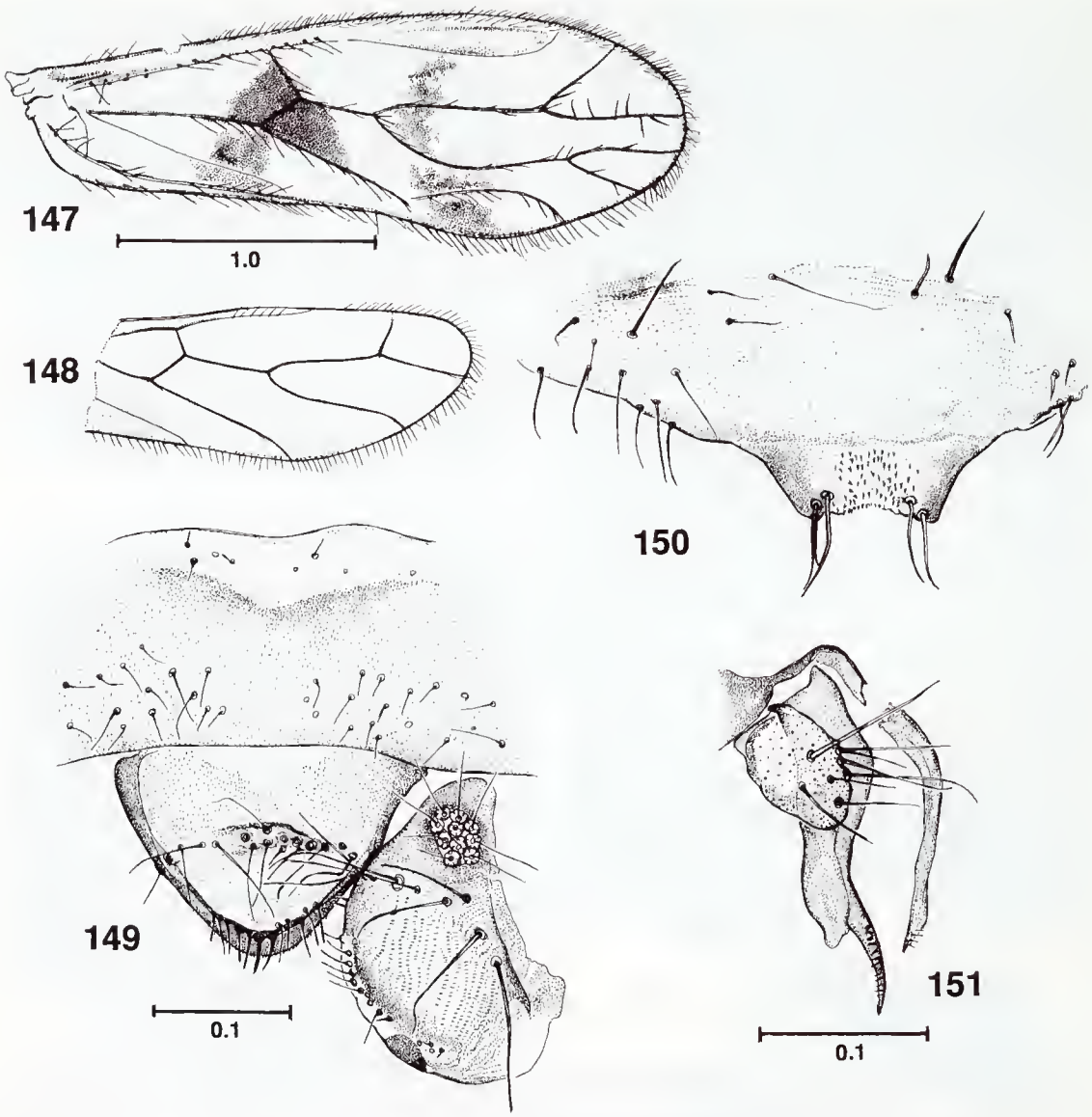
Morphology. IO:D = 2.2. Epiproct (fig. 154) hexagonal with 2 sides very short, thus almost square, a row of 6 close-set setae along posterior margin and 4–5 small fine scattered setae subapically; surface over apical sixth rugose with row of close-set spines along apical margin; 1 very long seta at each of the 4 posterior angles. Paraproct (fig. 155) with field of 10 trichobothria, duplex cone and 2 associated small setae on inner face, larger setae some distance away on inner face. Hypandrium (fig. 156) simple, rounded, setose. Phallosome (fig. 157) with pair of long, straight rods.

Dimensions. B 2.1, FW 3.22, HW 2.48, F 0.48, T 0.92, t_1 damaged, t_2 missing, f_1 = 0.545, f_2 = 0.316.

Remarks. Since only a single female was collected (from *Leptospermum laevigatum*) at Wilsons Promontory, but both sexes were collected at Kinglake, Victoria, the two Kinglake specimens were selected as types.

Pseudoscottiella yenoides is closely similar in body and wing pattern to *Pseudoscottiella yeni* New, also known from Victoria (Healesville). Females of *P. yenoides* may be distinguished by the hyaline anal cell of the fore wing combined with the more extensive transverse fascia in the apical half of the fore wing, cell R_5 being included in this pigmented band.

The pair of rods in the phallosome of *P. yenoides* are shorter than those of *P. rotundata*



Figures 147–151. *Pseudoscottiella yenoides*. Female: 147, forewing; 148, hindwing; 149, epiproct and paraproct; 150, subgenital plate; 151, gonapophyses. Figures 147, 148 and 150 and 151 to common scales.

and *P. crenulata*, and like those of *P. tanei*, which are also short, have a short basal apophysis directed towards the mid-line at right angles to the axis of the rod. The apical rugose field of the male epiproct is also present in *P. tanei*, but is not mentioned in the description of *P. crenulata*, and is absent in *P. rotundata*. Thus on male genitalia there are two pairs of species: *P. crenulata* and *P. rotundata*, and *P. yenoides* and *P. tanei*. The male of *P. yeni* is unknown. *P. tanei* is the only continental Australian species of *Pseudoscottiella* in which the male is known to have patterned fore wings.

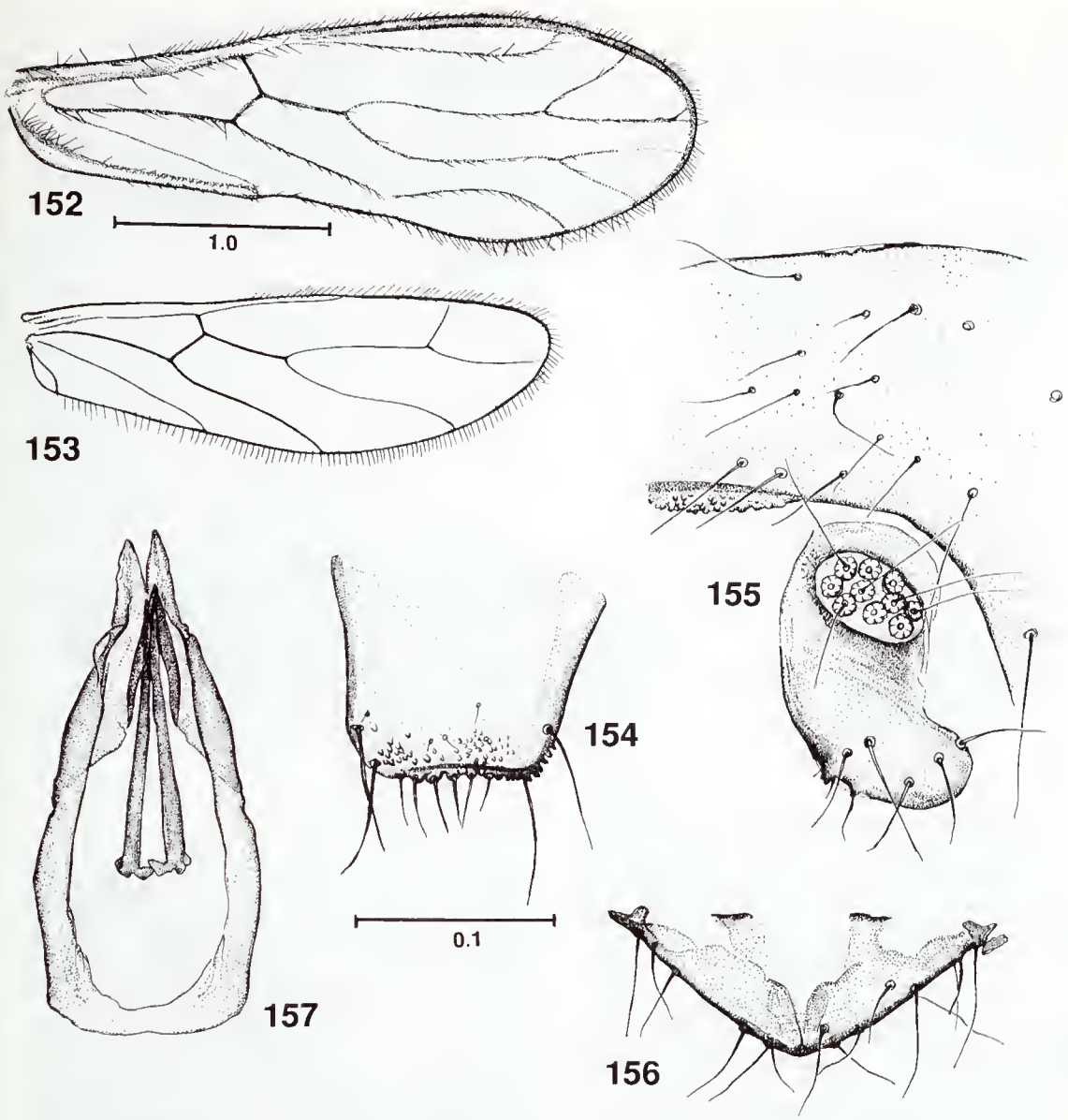
Philotarsidae Pearman

Aaroniella Mockford

Aaroniella Mockford, 1951: 102. Type species: *Elipsocus maculosus* Aaron.

Aaroniella rawlingsi Smithers

Aaroniella rawlingsi Smithers, 1969: 324.



Figures 152–157. *Pseudoscottiella yenoides*. Male: 152, forewing; 153, hindwing; 154, epiproct; 155, paraproct and ninth tergite; 156, hypandrium; 157, phallosome. Figures 152, 153 and 154–157 to common scales.

Material examined. 86♀, 32♂, 16 nymphs: site 14 (Apr 1984, Apr 1990, Jan 1991), site 15 (Apr 1984, Jan 1985), site 33, site 34.

Remarks. A. rawlingsi is widespread across southern Australia, being known from Western Australia, South Australia, NSW, Victoria, the Bass Strait islands and Tasmania. It was originally described from New Zealand. Found here on *Melaleuca ericifolia* (site 14), on open heath (site 15) and on mangroves (sites 33 and 34).

Haplophallus Thornton

Haplophallus Thornton, 1959: 336. Type species: *Haplophallus orientalis* Thornton.

Haplophallus sinus Thornton and New

Haplophallus sinus Thornton and New, 1977: 20.

Material examined. 363♀, 218♂, 36 nymphs: site 1 (Jan, Feb, Mar, Nov 1985, Jan, Feb 1986), site 3 (Feb 1986), site 4 (Mar, May, Nov 1985, Feb 1986), site 5 (May 1985, Feb 1986), site 8 (Jan 1991), site 9 (Nov,

Dec 1985, Jan, Feb 1986), site 10 (Jan, May, Sep, Oct, Nov 1985, Jan, Feb 1986), site 12, site 13, site 14 (Apr 1984, Apr 1990, Jan 1991), site 15 (Apr 1984), site 16, site 18, site 20, site 21, site 23, site 24, site 25, site 26, site 27, site 29, site 30, site 31, site 32, site 34, site 36, site 37, site 40, site 42, site 44.

Remarks. This common, widespread species has been recorded previously from Wilsons Promontory (Thornton and New, 1977), and occurs in practically all habitats sampled except bracken and closed forest.

Latrobiella Thornton

Latrobiella Thornton, 1981: 433. Type species: *Haplophallus bundoorensis* New.

Latrobiella fenestrata sp. nov.

Figures 158–166

Material examined. Holotype ♀ : Lilly Pilly Nature Track, closed forest, 21–23 Feb 1986; allotype ♂, 2♂ paratypes; holotype locality, 1–3 Nov 1985 (K73694–K73697). Additional records (1♀, 2♂): site 25.

Description of female. Coloration (after ca 5 yr in alcohol). Head generally cream with following brown marks: usual pattern of patches on vertex and mesial to orbits; triangular patch anterior to ocellar protuberance dark brown with smaller lighter brown patch each side; vertex-frons suture lined with brown, a brown line from suture to orbit. Gena brown posteriorly. Clypeal striae merging medially. Labrum dark brown. Antenna brown, apex of pedicel cream, flagellar segments without cream apices. Maxillary palps light brown, apical segment dark brown. Eyes black, ocelli clear with black centripetal borders. Thoracic nota brown with cream margins, cream median line includes scutella. Thoracic pleura dark brown over dorsal third, otherwise cream with narrow brown band just above ventral edge, side of thorax thus appears longitudinally banded in brown and cream. Procoxa cream, meso and metacoxa brown; trochanter cream; femur pale buff with small brown isolated spots; hind femur brown over proximal third; tibia pale buff; tarsal segments brown. Fore wing (fig. 158) with distinctive pattern of dark brown and hyaline areas, reticulated hyaline pattern in cells *R* and *M+Cu*; bases of setae surrounded by brown pigment, posterior margin of wing bounding areola postiea and cells M_3 and M_2 dark brown. Hind wing (fig. 159) hyaline with pale brown band around posterior margin apically, cell Cu_2 brown. Abdomen dorsally buff, terga posteriorly with narrow brown band incorporating small light buff patches; first and second terga with broad cream band in midline, brown more laterally, remaining terga with brown band in midline; abdomen ventrally light brown, sternites 6 to 8 darker brown; apex of abdomen cream.

Morphology. IO:D = 5.5. Apical segment of antenna not attenuated but with single apical seta (fig. 160). Claw with small preapical tooth. In fore wing vein cu_2 bare, vein setae in single rank except veins *r*, *an* and basal seetion of cu_1. Additional branch of vein *m+cu* curves distally to almost meet vein cu_1, partially enclosing a circular additional cell (in both wings); wing outline slipper shaped. Setae on hind wing veins: r_1 1, *rs* 0, r_{2+3} 0, r_{4+5} 10, *m* 1, cu_1 0. Epiproet (fig. 161) rectangular, setose over apical half, 2 longer setae on posterior margin. Paraproct (fig. 161) with field of 28 trichobothria and 1 seta not in rosette socket. Subgenital plate (fig. 162) with apical sclerite bearing 4 small setae on distal margin. Gonapophyses (fig. 163): outer valve triangular, rounded posteriorly, setose; ventral valve narrow with fine recurrent spinelets apically; dorsal valve with slightly raised field of minute spines on distal margin.

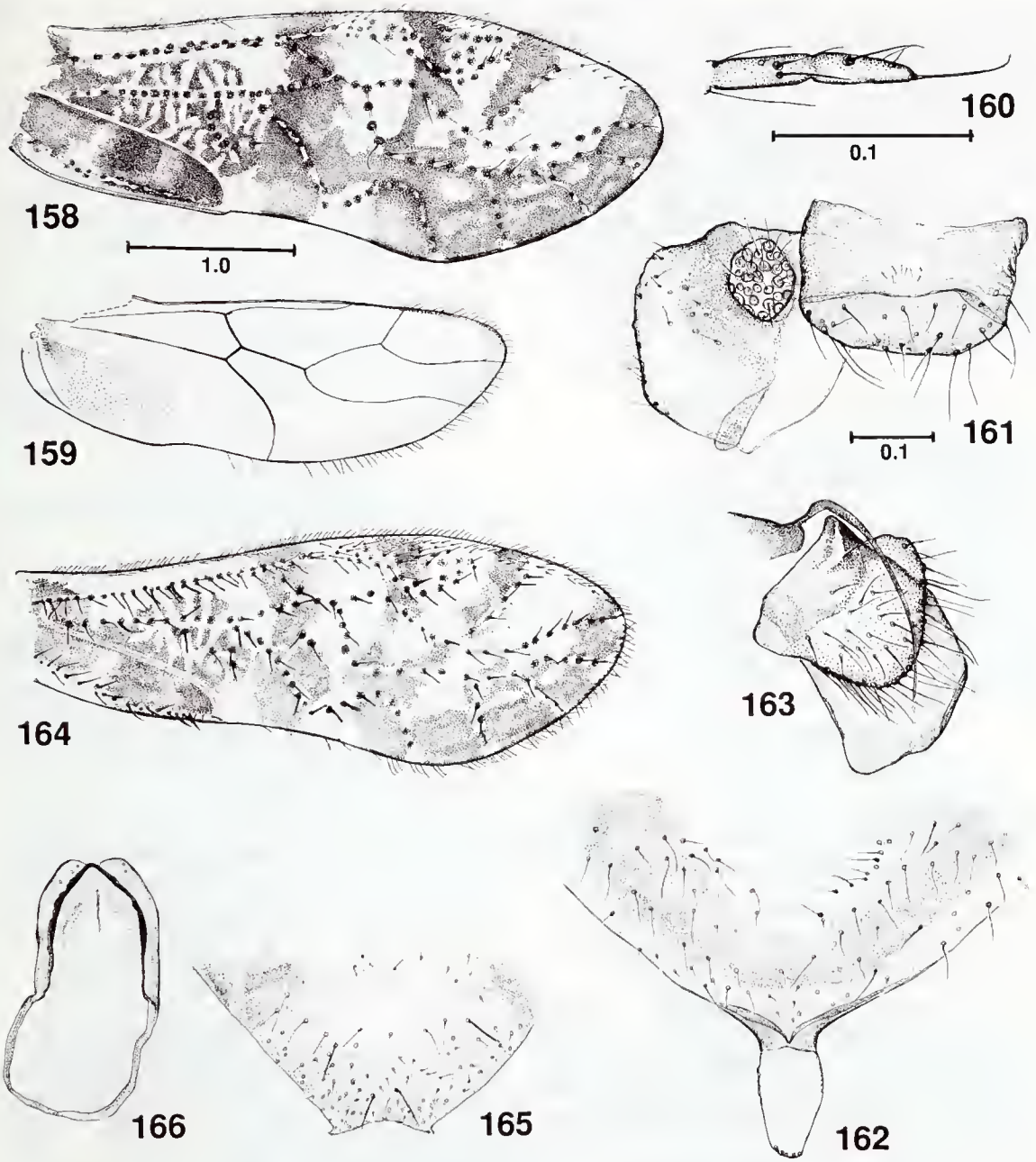
Dimensions. B 2.8, FW 3.84, HW 2.89, F 0.63, T 1.29, t_1 0.411, t_2 0.071, t_3 0.071, rt 5.8:1:1, ct 18, 0, 0, f_1 0.466, f_2 0.411.

Description of male. Coloration (after ca 5 yr in alcohol). As female.

Morphology. IO:D = 5.0. Apical segment of antenna not attenuated, with 2 apical setae; flagellar setae longer than in female. Claw with small preapical tooth. Fore wing (fig. 164): vein cu_2 bare; addition vein in cell *M + Cu* not discernible but 3 setae within cell in position of vein in female. Setae on hind wing veins: r_1 0, *rs* 0, r_{2+3} 0, r_{4+5} 13, *m* 7, cu_1 0. Epiproct with eurved posterior margin, setose. Paraproct with field of 36 trichobothria and 2 setae not in rosettes. Hypandrium (fig. 165) incised basally, apically emarginate with a pair of short pointed curved hooks, setose, setae near apical margin short, fine; a close-set subapical pair of strong setae and a more widely set pair in the middle of hypandrium. Phallosome (fig. 166) lacking sclerites within frame.

Dimensions. B 2.2, FW 3.72, HW 2.74, F 0.65, T 1.39, t_1 0.434, t_2 0.079, t_3 0.087, rt 5.5:1:1.1, ct 20, 0, 0, f_1 0.711, f_2 0.592.

Remarks. This species exhibits a mosaic of character states found in *Latrobiella* and *Haplophallus*. It is *Haplophallus*-like in: the form of the hypandrium apex, vein cu_2 in the fore wing bare,



Figures 158–166. *Latrobiella fenestrata*. Female: 158, forewing; 159, hindwing; 160, apical segment of antenna; 161, epiproct and paraproct; 162, subgenital plate; 163, gonapophyses. Male: 164, forewing; 165, hypandrium; 166, phallosome. Figures 158, 159 and 164 and 161–163, 165 and 166 to common scales.

antennal apex not attenuated. *Latrobiella*-like characters are: the form of the subgenital plate, the outer and dorsal valves of the female gonapophyses, female antennal apex with a single long, stout seta, fore wing setae sited on dark spots. The hypandria of *Latrobiella mouldsi* Thornton and New from north Queensland and to a lesser extent *Latrobiella ornatus* Thornton and New from NSW and Queensland, *Latrobiella alticola* Thornton and Smithers and *Latrobiella setosa* Thornton and Smithers from the high mountains of New Guinea, are of the *Haplophallus* type in that they are not notched along the posterior margin and have rather angu-

lar postero-lateral corners, which in *L. mouldsi* are incipiently recurved. *L. fenestrata* therefore would not be unique in the genus *Latrobiella* in having a *Haplophallus* type of hypandrium. However, in having vein cu_2 of the fore wing bare, and in the characteristic wing pattern, including a reticulated network of dark pigment and hyaline areas in cell *M* + *Cu*, it differs from all other known Australian species of *Latrobiella*, but is similar to *Latrobiella parda* (Thornton, Wong and Smithers) from New Zealand. *L. fenestrata* can be distinguished from *L. parda* in having the fore wing vein setae sited on dark spots, and in the form of the subgenital plate.

Latrobiella guttata (Tillyard)

Philotarsus guttatus Tillyard, 1923: 181.
Haplophallus guttatus. — Smithers, 1969: 322.
Latrobiella guttata. — Thornton, 1981: 433.

Material examined. 28♀, 8♂, 23 nymphs: site 3 (Jan, Dec 1985, Jan, Feb 1986), site 4 (Jan 1985), site 10 (Jan, Feb 1986), site 15 (Jan 1985), site 40.

Remarks. This species, found here in heathland and dune vegetation, is widely distributed in southern mainland Australia, Tasmania and New Zealand.

Elipsocidae Pearman

Drymopsocus Smithers

Drymopsocus Smithers, 1963a: 36. Type species: *Drymopsocus brunneus* Smithers.

Drymopsocus brunneus Smithers

Drymopsocus brunneus Smithers, 1963a: 36.

Material examined. 7♀: site 8 (Apr, May, Nov 1985, Jan 1986, Jan 1991), site 19.

Remarks. This is the first record of *D. brunneus* since its description from NSW material. Females only were collected at Wilsons Promontory, in closed forest (site 8) and tall open forest (site 19). All were macropterous, with a fore wing length of about 1.9 mm.

Pentacladus Enderlein

Pentacladus Enderlein, 1906: 408. Type species: *Pentacladus eucalypti* Enderlein.

Pentacladus eucalypti Enderlein

Pentacladus eucalypti Enderlein, 1906: 408.

Material examined. 11♀, 10♂, 1 nymph: site 19, site 24 (dead *Eucalyptus* leaves), site 28 (Apr 1990, Apr 1991 – nearby dead *Eucalyptus* leaves).

Remarks. P. eucalypti is known from all eastern Australian states from Tasmania to Queensland, and from South Australia. It has also been recorded from New Zealand.

Propsocus McLachlan

Propsocus McLachlan, 1866: 352. Type species: *Propsocus pallipes* McLachlan.

Propsocus pulchripennis (Perkins)

Stenopsocus pulchripennis Perkins, 1899: 83.
Propsocus pulchripennis. — Zimmerman 1957: 179.

Material examined. 1♀: site 2 (Mar 1985).

Remarks. This widespread species recorded in Australia from all states except the Northern Territory was found here in low eucalypt woodland.

Spilopsocus Smithers

Spilopsocus Smithers, 1963b: 894. Type species: *Spilopsocus ruidis* Smithers.

Spilopsocus masseyi New

Spilopsocus masseyi New, 1971: 226.

Material examined. 105♀, 36♂, 12 nymphs: site 1 (Feb, Mar, Apr, May, Jul, Aug, Sep, Oct, Nov, Dec 1985, Jan, Feb 1986), site 2 (Apr 1985, Jan 1986), site 3 (Jan 1986), site 10 (Apr, May, Sep, Oct, Nov, Dec 1985, Jan, Feb 1986), site 12, site 14 (Apr 1984, Apr 1990), site 15 (Apr 1984), site 18, site 20, site 21, site 29, site 32, site 33, site 34, site 40.

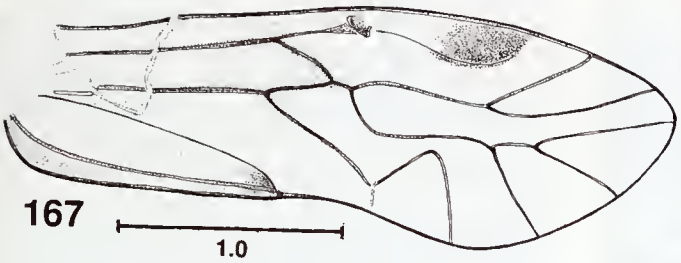
Remarks. Found in coastal vegetation at Wilsons Promontory, including *Casuarina* (sites 1 and 21) and mangroves (sites 33 and 34). *S. masseyi* has been recorded from South Australia, NSW, Victoria and the Bass Strait islands.

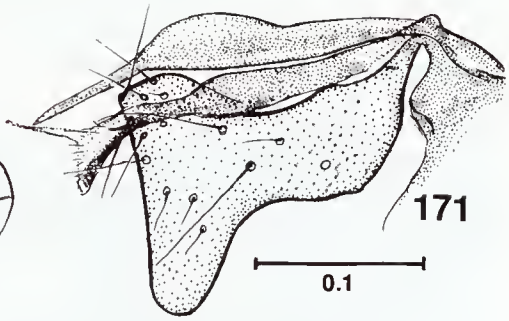
Spilopsocus serratus sp. nov.

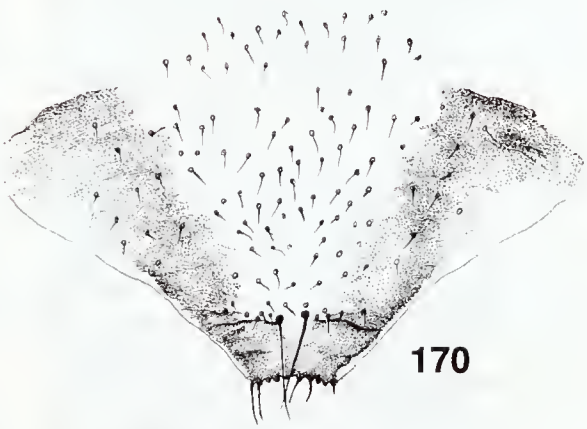
Figures 167–175

Material examined. Holotype ♀: Telegraph Saddle, low eucalypt woodland, 27–29 Mar 1985; allotype ♂: Little Oberon Bay Track, *Casuarina stricta*, 8–10 Sep 1985; 2♀, 1♂ paratypes: allotype locality, 26–27 Jan 1986 (K73698–K73702). Additional records (2♀, 4♂): site 1 (Jan, Feb 1986), site 2 (Nov 1985, Feb 1986).

Description of female. Coloration (after ca 5 yr in alcohol). Epicranium buff with brown markings either side of median epicranial suture and brown spots, some confluent, adjacent to eyes. Frons with broad brown band from ocellar protuberance to antennal socket, darker median stirrup mark touching epistomial suture, which is dark brown. Striae on postclypeus obvious, no medial darkening. Labrum brown, maxillary palps pale greyish brown, distal segment dark brown. Gena with diagonal line from below







Figures 167–175. *Spilopsocus serratus*. Female: 167, forewing; 168, hindwing; 169, epiproct and paraproct; 170, subgenital plate; 171, gonapophyses. Male: 172, forewing; 173, hindwing; 174, hypandrium; 175, phallosome. Figures 167, 168, 172 and 173 and 169, 170, 174 and 175 to common scales.

orbit to below antennal socket, delimiting a pale buff posterior area from brown pigment between eye and antennal socket. Antenna brown, flagellar segments with white apices, eyes black. Ocellar protuberance brown, ocelli with dark centripetal crescents. Antedorsum and lateral lobes of mesothorax brown, buff adjacent to sutures; scutellum darker than lobes but with white median mark. Metathoracic terga and thoracic pleura brown. Legs with coxa, femur and tarsal segments brown, trochanter pale, tibia pale buff with dark brown basal tenth and apical fifth. Fore wing (fig. 167) hyaline with dark brown patch covering apical half of pterostigma, stigmasae brown, narrow light brown clouding around sections of veins *m* and *r* basal to their fusion, faint brown cloud over distal angle of cell Cu_2, cell *An* fuscous over basal one-third. Hind wing (fig. 168) hyaline. Abdomen dorsally cream, terga 5 to 7 brown, abdomen thus has broad brown transverse band about half way along its length, fourth tergite with some brown pigment over median third; ventrally grey-brown, cream along sutures; apical selerites dark brown.

Morphology. IO:D = 4.8. Claw with preapical tooth. Fore wing glabrous. Hind wing with veins *rs* and *m* fused for a length, vein cu_1 not strongly recurved at wing margin, glabrous. Epiproct (fig. 169) rounded posteriorly, setose, with 4 longer stout setae equally spaced just anterior to posterior margin. Paraproct (fig. 169) with round field of 25 trichobothria. Subgenital plate (fig. 170): apex broad, slightly concave, bearing row of 10 prominent setae; a pair of very long setae anterior to this row, intervening area glabrous; remainder of plate with small fine scattered setae. Gonapophyses (fig. 171): ventral valve expanded midway along length; dorsal valve with divided apex; outer valve boot-shaped.

Dimensions. B 2.5, FW 2.95, HW 2.27, F 0.58, T 1.08, t_1 0.269, t_2 0.071, t_3 0.099, rt 3.8:1:1.4, ct 15, 0, 0, f_1 0.521, f_2 0.316.

Description of male. Coloration (after ca 5 yr in alcohol). As female with following exceptions: flagellum wholly brown, pterostigma of fore wing wholly pale brown (fig. 172).

Morphology. IO:D = 2.5. Claw with preapical tooth. Fore wing glabrous. Hind wing (fig. 173) with *rs* and *m* fused for a length, vein cu_1 not strongly recurved at wing margin, glabrous. Epiproct triangular, narrow, lateral margins sclerotised. Paraproct with field of 36 trichobothria. Hypandrium (fig. 174): sclerotisations on postero-lateral margins, membranous gusset medially on posterior margin with an isolated selerotised area in midline. Phallosome (fig. 175) with smoothly rounded, serrate, aedeagal arch; large stout sclerites within phallic frame.

Dimensions. B 2.0, FW 3.45, HW 2.63, F 0.58, T 1.29, t_1 0.371, t_2 0.079, t_3 0.103, rt 4.7:1:1.3, ct 16, 1, 0, f_1 0.735, f_2 0.423.

Remarks. Collected from *Casuarina stricta* (site 1) and low eucalypt woodland (site 2).

Eight *Spilopsocus* species are now described, four from Australia, one from Lord Howe Island and three from New Zealand. *S. serratus* differs from other described species, except *Spilopsocus parvus* Smithers and Thornton (Lord Howe I.), in the distinctive serrate aedeagal arch of the phallosome, and possesses more apical setae on the terminal lobe of the subgenital plate (10) than any other described species (from 4 in *Spilopsocus ruidis* Smithers to 8 in *S. parvus*). Vein cu_2 of the hind wing is curved towards the wing margin to meet it at right angles or more, as in other propsocine genera, in all species in which this condition is noted (not mentioned or figured in descriptions of the Australian species *Spilopsocus masseyi* New and *Spilopsocus colliensis* Smithers). The fore wing pattern is slight and simple, not complex as in *S. ruidis, S. masseyi, Spilopsocus annulatus* Smithers (New Zealand) and *S. colliensis*, and does not include a basal transverse fascia as in *S. parvus* and *Spilopsocus stigmaticus* Smithers (New Zealand). The areola postica in the fore wing is high and trianguloid, as in *S. parvus, S. stigmaticus* and *Spilopsocus avius* Smithers (New Zealand), in contrast to the low semi-circular condition seen in *S. masseyi* and *S. annulatus*.

Psocidae Stephens

Blaste Kolbe

Blaste Kolbe, 1883b: 79. Type species: *Blaste juvenilis* Kolbe.

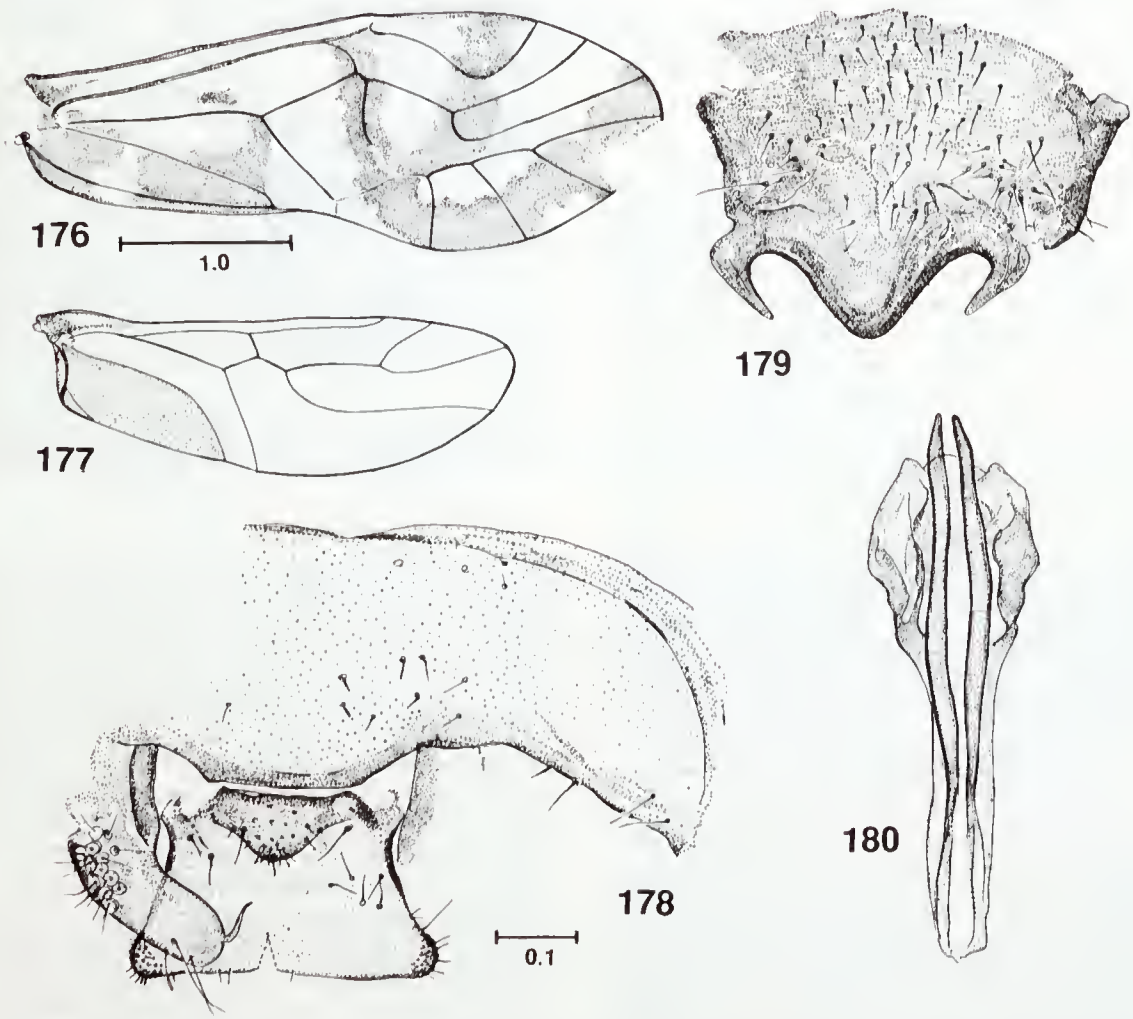
Blaste bistriata sp. nov.

Figures 176–180

Material examined. Holotype ♂: Stockyard camp, wooden fence, 7 Apr 1991; paratype ♂: same data as holotype (K73703, K73704).

Description of male. Coloration (after ca 2 mo in alcohol) Eyes black. Ground color of head creamy-buff, usual vertex markings and ocellar protuberance brown; narrow brown band extends laterally from posterior of ocellar protuberance to lateral vertex marks, wider brown band parallel to this extends in front of ocellar

protuberance to point posterior to antennal socket; brown stirrup mark in middle of frons; ocelli with black centripetal margins; area between orbit and antennal socket brown; genae creamy-buff; clypeus brown, striae merging. These markings produce an effect such that the front of the head carries a broad median brown band which is crossed at right angles by 2 narrower brown bands thus isolating 3 pairs of creamy-buff areas, 2 on the vertex and 1 on the frons. Labrum brown. Scape, pedicel and basal flagellar segment pale brown, f_1 darkening apically; rest of flagellum dark brown. Maxillary palps with basal segment pale brown, apical segment dark brown, other segments brown. Thoracic terga brown with cream margins, pleural sclerites and coxae of legs brown except those associated with anterior leg creamy-buff. Trochanter and femur of hind leg cream, except distal quarter of femur brown; trochanter and femur of anterior leg cream shading to buff distally, those of middle leg buff. Tibiae light brown, darkening distally, tarsi brown. Fore wing (fig. 176) with characteristic brown and dark brown pigment pattern. Hind wing (fig. 177) with brown cloud in cubital cell. Abdominal terga with brown patches forming a broad interrupted dorsal stripe, these patches less continuous laterally; abdominal sterna cream with faint brown posterior transverse striae. Ninth



Figures 176–180. *Blaste bistriata*. Male: 176, forewing; 177, hindwing; 178, epiproct and paraproct; 179, hypandrium; 180, phallosome. Figures 176, 177 and 178–180 to common scales.

tergite, epiproct, paraprocts, hypandrium and phallosome brown.

Morphology. IO:D = 2.4, eyes offstanding. Clypeus, labrum and thoracic terga waxy. Outer edge of discoidal cell of fore wing concave; a hyaline lunule at margin of cells M_1, M_2 and M_3 (cell M_1 margin torn in holotype). Epiproct (fig. 178) small, rounded with 3 stout setae and field of smaller close-set setae apically; a very large dorsal flap, subrectangular, with sclerotised margins and with its rounded distal corners beset with low, pointed spines. Paraproct (fig. 178) with apical spine, and circular field of 38-40 trichobothria. Hypandrium (fig. 179) symmetrical, with rounded median lobe and pair of curved pointed horns. Phallosome (fig. 180) elongate, inner parameres straight, pointed; outer parameres sinuous, connected by membraneous tissue.

Dimensions. B 2.5, FW 3.68, HW 2.63, F 0.77, T 1.57, t_1 0.569, t_2 0.142, rt 4.0:1, et 24, 3, f_1 0.768, f_2 0.691.

Female. Unknown.

Remarks. As summarised by Smithers (1984), on a number of genitalic and other characters, six Australian species of *Blaste* form a close-knit group, which may be a distinct generic grouping. *B. bistriata* is a seventh member of this group, and is most similar to *Blaste macrops* Smithers in hypandrial structure, and to *Blaste lunulata* New in male wing pattern. It differs from *B. macrops* (South Australia) in having extensively patterned fore wings, and from *B. lunulata* (Western Australia) in details of the pattern, the pattern in *B. bistriata* being simpler and in particular having less pigment in cell *R*. Other species of this group are *Blaste falcifer* Smithers and *Blaste panops* Smithers (Tasmania), *Blaste furcilla* New (Western Australia) and *Blaste tillyardi* Smithers (New Zealand, NSW, South Australia, Wilsons Promontory and other areas of Victoria).

Blaste forficula sp. nov.

Figures 181–184

Material examined. Holotype ♂: Stockyard camp, coastal vegetation, 7 Apr 1991 (K73705).

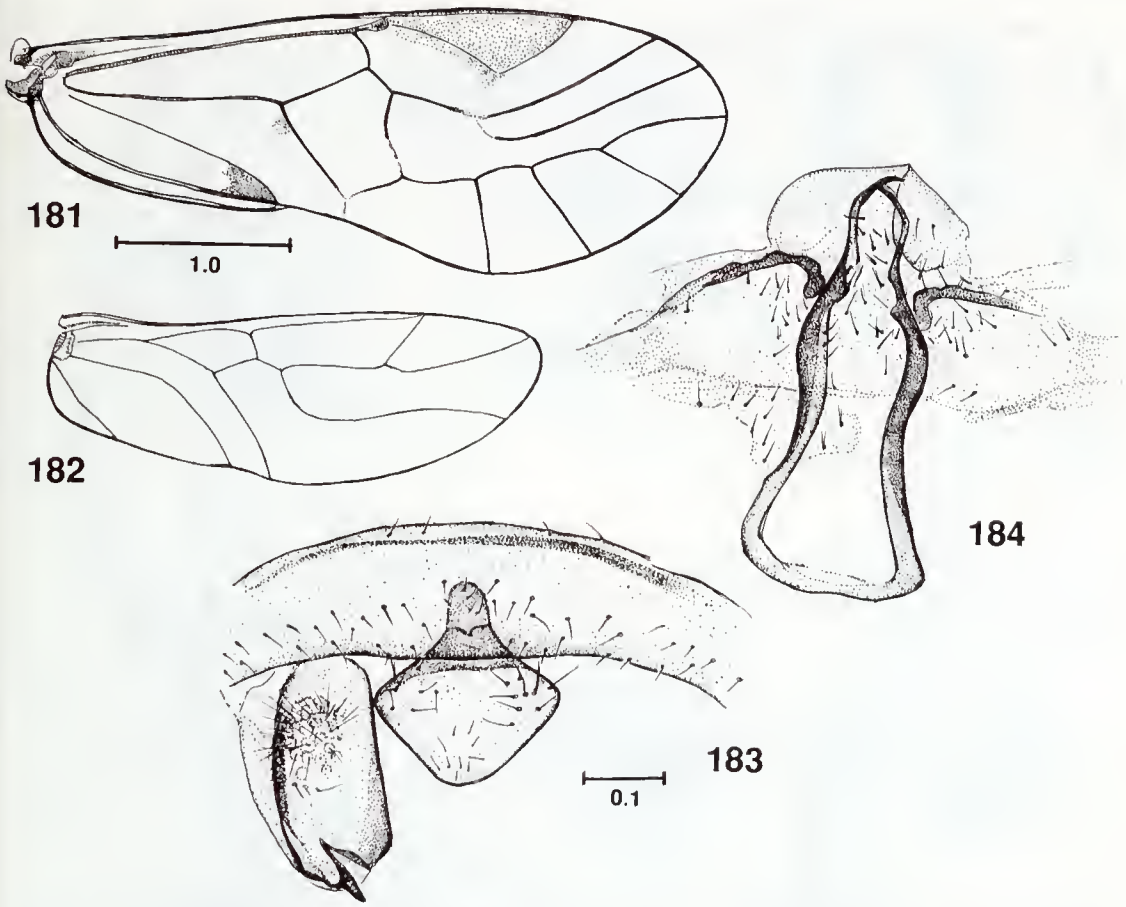
Description of male. Coloration (after ca 2 mo in alcohol). Head creamy-buff; eyes black. Posterior of vertex covered with brown pigment with irregular anterior border at level of posterior margin of eyes; ocellar protuberance creamy-buff, ocelli black; from each posterior ocellus transverse sinuous brown line extends to a point very close to anterior edge of eye where it bends anteriorly at right angles to fuse with a broader transverse band extending mesad to anterior ocellus. Anterior edge of frons with narrow brown band subparallel to the 2 mentioned above. Antennal socket ringed brown, faint brown band between this and orbit. Genae wholly creamy-buff. Postclypeus with faint brown parallel striae, labrum creamy-buff. Maxillary palps creamy-buff except apical segment brown, darkening distally. Antennae pale brown. Thoracic dorsa dark brown, margin cream, scutella cream. Sides of thorax below wing bases cream, narrow longitudinal brown band immediately above coxae, which are cream. Femora cream, posterior femur with apical brown spot; tibiae very pale buff with darker subapical ring; basal tarsal segment buff, apical segment darker. Fore wing (fig. 181) with sparse brown markings. Hind wing (fig. 182) hyaline. Abdomen cream.

Morphology. IO:D = 5.0. Epiproct (fig. 183) with tapering anterior extension, sclerotised lateral margins. Paraproct (fig. 183) with short, straight apical spine; with round field of 36-38 trichobothria. Hypandrium (fig. 184) semicircular, margin without setae or any ornamentation. Phallosome (fig. 184) angular and closed anteriorly, outer (?) parameres curved, forceps-like; inner (?) parameres straight, pointed, orientated laterally at right angles to long axis of frame.

Dimensions. B 2.8, FW 3.98, HW 2.88, F 0.71, T 1.57, t_1 0.458, t_2 0.142, rt 3.22:1, et 21, 3, f_1 0.787, f_2 0.806.

Female. Unknown.

Remarks. In phallosome structure, epiproct and paraproct this species resembles *Blaste magnifica* Smithers (South Australia). The anterior prolongation of the epiproct is somewhat narrower in *B. forficula* and the posterior surface of the epiproct bears very small, short setae, whereas that of *B. magnifica* bears very long setae. The straight, pointed inner (?) parameres of *B. forficula* are directed laterally, not towards the midline as in *B. magnifica*. Moreover, the fore wing of *B. forficula* lacks the unusual mottled pattern of *B. magnifica* and veins cu_{1a} and cu_{1b} are in a straight line and are approximately equal in length; the pterostigma has a somewhat pointed vertex with a short spurvein whereas in *B. magnifica* a spurvein is evidently lacking. The eyes of *B. forficula* are not sited on short, thick stalks as in *B. magnifica*.



Figures 181–184. *Blaste forficula*. Male: 181, forewing; 182, hindwing; 183, epiproct and paraproct; 184, phallosome and hypandrium. Figures 181, 182 and 183 and 184 to common scales.

The affinities of this unusual species are difficult to assess. Although there are some resemblances to *B. magnifica* (for example in apical phallosome structure) there are clear differences (for example in fore wing, hypandrium and placement of eyes) and the question of their congeneric status will have to be considered carefully when the large heterogeneous genus *Blaste* is revised.

Blaste lignicola (Enderlein)

Figures 185–192

Psocus lignicola Enderlein, 1906: 401.

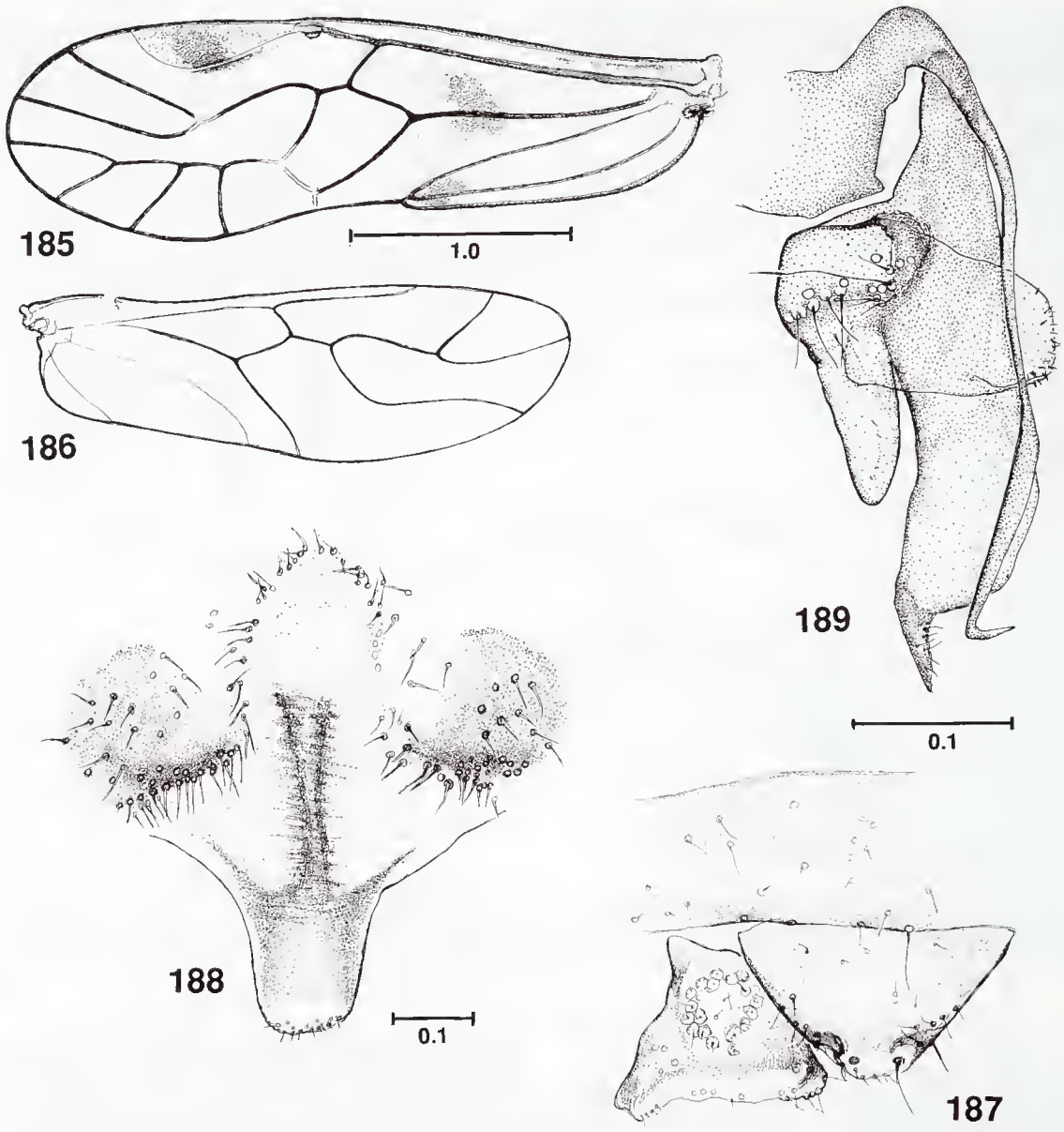
Euclismia lignicola. — Enderlein, 1925: 100. — New, 1971: 228–229.

Blaste (Euclismia) lignicola. — Badonnel, 1955: 253.

Blaste howicki New, 1974b: 290–291 (new synonymy).

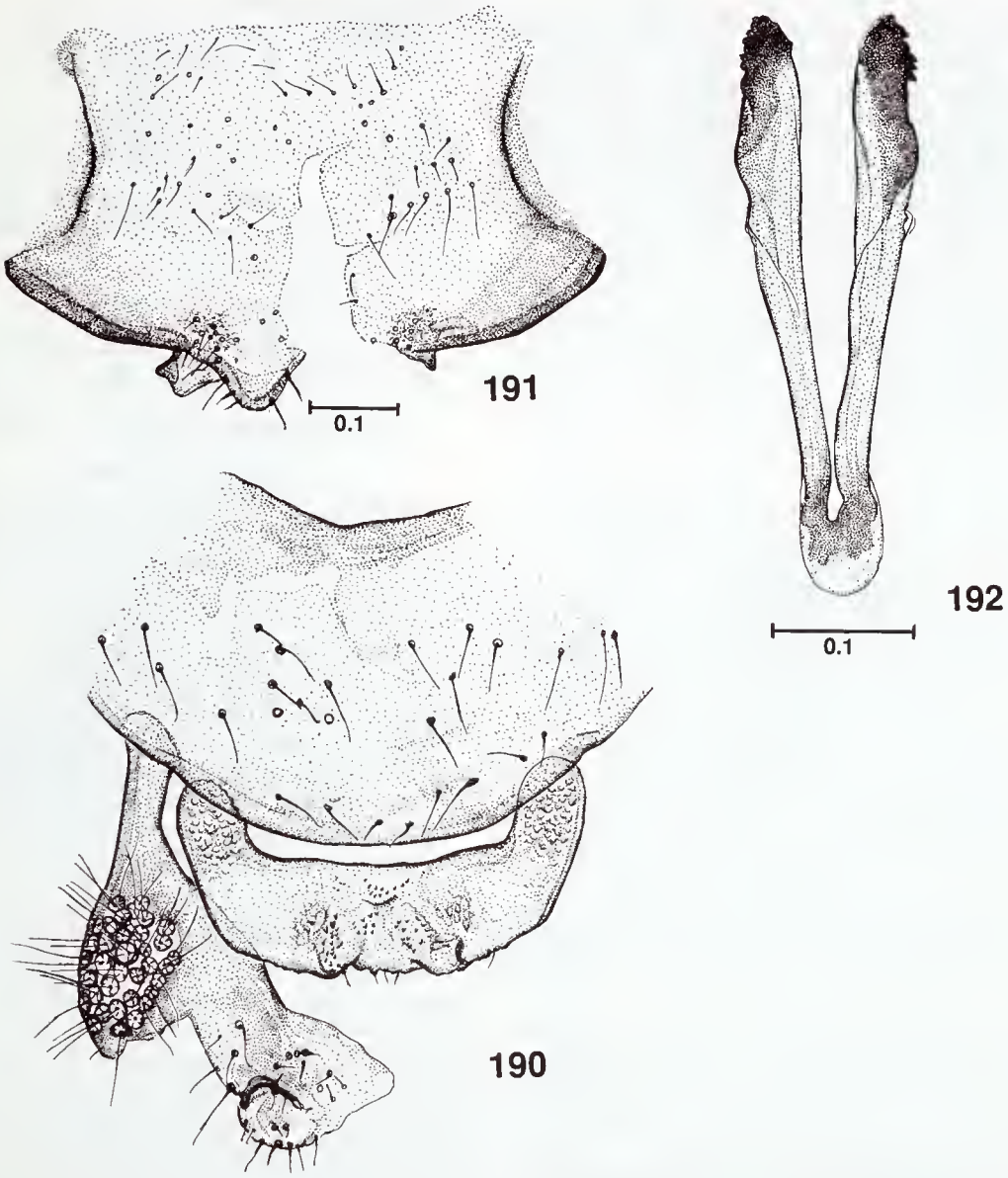
Material examined. Specimens on which descriptions based: ♀, ♂, Telegraph Saddle, low eucalypt woodland, 22–25 Jan 1985. Additional records (91♀, 49♂, 95 nymphs): site 1 (Mar, Apr, Dec 1985, Jan 1986), site 2 (Jan, Feb, May, Jun 1985, Jan 1986), site 3 (Feb 1986), site 4 (Dec 1985, Jan 1986), site 9 (Jun 1985, Jan 1986), site 10 (Mar, Dec 1985), site 11 (Apr, Dec 1985, Jan 1986), site 13, site 14 (Apr 1984, Jan 1991), site 15 (Apr 1984), site 22, site 23, site 27, site 29, site 30, site 31, site 32, site 33, site site 35, site 37, site 41, site 43, site 44 (nymph only).

Further description of female. Coloration (after ca 5 yr in alcohol). Head cream with the following markings brown: small patches along posterior of vertex, mesad of orbits and each side of epicranial suture; band of epicranial suture patches broadens anteriorly to form a Y. Each side of vertex posteriorly, an isolated grey-brown patch, a grey-brown patch of similar size



Figures 185–189. *Blaste lignicola*. Female: 185, forewing; 186, hindwing; 187, epiproct and paraproct; 188, subgenital plate; 189, gonapophyses. Figures 185, 186 and 187 and 188 to common scales.

each side of occllar protuberance, which is black. Frons with trapezoid grey-brown mark anterior to occllar protuberance, mark broader anteriorly; a grey-brown band between antennal socket and orbit. Antenna with scape pale brown, pedicel cream, f_1 pale brown, brown distally, flagellum otherwise brown with short cream bands at joints. Postclypeus with broad grey-brown band medially, anteclypeus cream, labrum brown. Apical segment of maxillary palp brown. Eyes black. Thoracic terga brown, cream arrow-shaped mark on mesothoracic pronotum, scutella pale, thoracic pleura brown. Legs: coxa brown basally, paling to cream; femur cream; tibia pale brown; tarsal segments darker. Fore wing (fig. 185) membrane very faint brown, paler basally, darker pigment confined to 3 large patches; areola postica veins extensively hyaline. Hind wing (fig. 186) hyaline. Abdomen with broad grey-brown transverse bands dorsally,



Figures 190–192. *Blaste lignicola*. Male: 190; epiproct, paraproct and ninth tergite; 191, hypandrium; 192, phallosome. Figures 190 and 192 to common scale.

ventrally cream; insect from side thus appears cream ventrally, pigmented dorsally.

Morphology. IO:D = 4.0. Epiproct (fig. 187) trapezoid with apical membranous lobe bearing a pair of long fine setae, at base of which is pair of sclerotised hooks. Paraproct (fig. 187) with circular field of 28 trichobothria and 1 seta without rosette. Subgenital plate (fig. 188) with heavily pigmented median band basal to apical lobe, band dividing anteriorly; sinuous band of setae extends from posterior edges of lateral sclerotised areas to anterior of plate. Gonapophyses (fig. 189).

Dimensions. B 2.9, FW 3.10, HW 2.36, F 0.75, T 1.38, t_1 0.395, t_2 0.134, rt 3.0:1, ct 14, 0, f_1 0.458, f_2 0.316.

Further description of male. Coloration (after ca 5 yr in alcohol). As female, but antenna wholly brown.

Morphology. IO:D = 3.8. Epiproct (fig. 190) with lateral anteriorly directed lobes covered with rounded papillae, a broad median finely papillose tract and a group of fine setae on posterior border medially. Paraproct (fig. 190) with oval field of 36 trichobothria. Hypandrium (fig. 191) with small rounded posterior lobe bearing about 5 setae on thickened margin, an adjacent sclerotised broad tooth, a small, finely granulated region with a group of about 9 setae immediately anterior to this tooth; lateral margins heavily sclerotised, a large laterally directed prominence on each side. Phallosome (fig. 192) as illustrated by New (1971).

Dimensions. B 2.6, FW 3.45, HW 2.68, F 0.69, T 1.40, t_1 0.403, t_2 0.111, rt 3.63:1, ct 23, 0, f_1 0.652, f_2 0.494.

Remarks. This species was collected from all vegetation types except bracken and closed forest.

Since Enderlein's original descripton of this species from material from Sydney, NSW, it has been recorded from Norfolk Island, Flinders, King and Curtis Islands in Bass Strait and Wilsons Promontory. *Blaste howicki* New, described from a single female found in a termite mound near Morwell, Victoria, before females had been found in association with males of *B. lignicola*, conforms in all respects to females found with males at Wilsons Promontory. The unusual fleshy spiculate mesial lobe of the outer valve mentioned and figured by New, is present also in the Wilsons Promontory specimens; the narrow posterior lobe, however, figured here (fig. 189), is folded in the set of gonapophyses figured by New, and present, although unsclerotised, on the right gonapophyses of his specimen (seen). The fore wing pigmentation of the Morwell specimen is faint.

There is an indication of variation in chaetotaxy of the female epiproct: medium-sized lateral setae vary in number from 6 to 9 on each side in the Wilsons Promontory material, the King Island female has 12 on each side and New's Morwell specimen 8 and 9.

Blaste taylori New

Blaste taylori New, 1974b: 286.

Material examined. 2♀, 1♂, 2 nymphs: site 6 (May 1985), site 8 (Jan 1991 – nymph only), site 29, site 41 (nymph only).

Remarks. This species, originally described from Western Australia, has since been recorded from NSW, Victoria and the Bass Strait islands.

Blaste tillyardi Smithers

Blaste tillyardi Smithers, 1969: 338.

Material examined. 1♀, 1♂: site 30, site 42.

Remarks. B. tillyardi is known from NSW and Victoria. It was originally described from New Zealand.

Clematostigma Enderlein

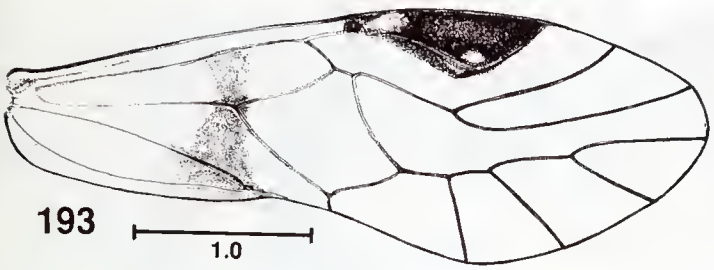
Clematostigma Enderlein, 1906: 403. Type species: *Copostigma maculiceps* Enderlein.

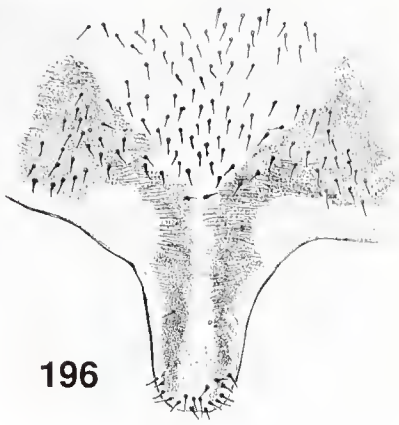
Clematostigma lunulata sp. nov.

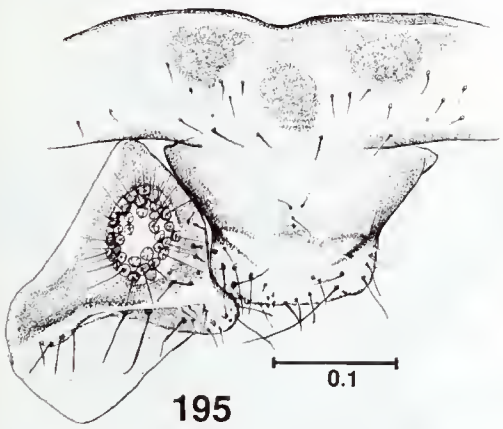
Figures 193–201

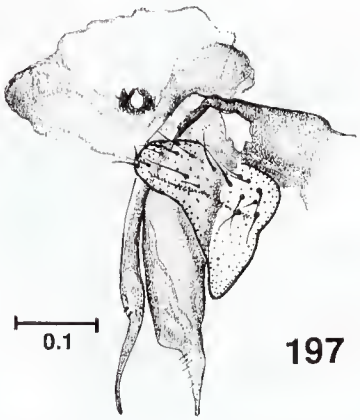
Material examined. Holotype ♀: Cotters Lake, *Leptospermum lanigerum*, 18 Apr 1990; allotype ♂, 3♀ paratypes: same data as holotype (K73706–K73710). Additional records (10♀, 10♂): site 14 (Jan 1991), site 29, site 31, site 35, site 42, site 44.

Description of female. Coloration (after ca 6 mo in alcohol). General body color pale cream. Head with pattern of brown spots each side of epicranial suture, along posterior margin of head and mesad of orbits, the orbital patch not continuous with posterior pattern of pigmentation. Epicranial suture pale. Ocelli with black centripetal margins. A brown stirrup mark in centre of frons. Antennal socket ringed dark brown. Pale brown striae on postclypeus, anteclypeus pale, labrum dark brown. Apical segment of maxillary palp dark brown to black. Eyes black. Second flagellar segment pale brown darkening to brown distally, more distal segments brown, basal 3 antennal segments pale cream. Thoracic nota dark brown, contrasting with pale cream margins, mesothoracic antedorsum with pale cream median line, mesothoracic dorsal lobes with pale cream narrow wedge towards posterior of lobe, metathoracic dorsal lobes with pale cream oblong area towards posterior of lobe. Mesothoracic epimeron and postnotum, and metathoracic episternum brown; other sclerites on side of thorax pale cream. Legs pale cream with following exceptions: basal half of coxa, a broad subapical band on femur, a narrow sub-basal and apical ring on tibia and whole of tarsus dark brown. Fore wing (fig. 193) with wedge-shaped brown transverse fascia in basal half of wing not extending into costal cell, stigmasac dark brown, pterostigma with brown pigment and a hyaline window near vertex, the size of this window differs in the 2 wings. Veins in basal half of wing









Figures 193–197. *Clematostigma lunulata*. Female: 193, forewing; 194, hindwing; ;195, epiproct, paraproct and ninth tergite; 196, subgenital plate; 197, gonapophyses and spermathecal plate. Figures 193, 194 and 196 and 197 to common scales.

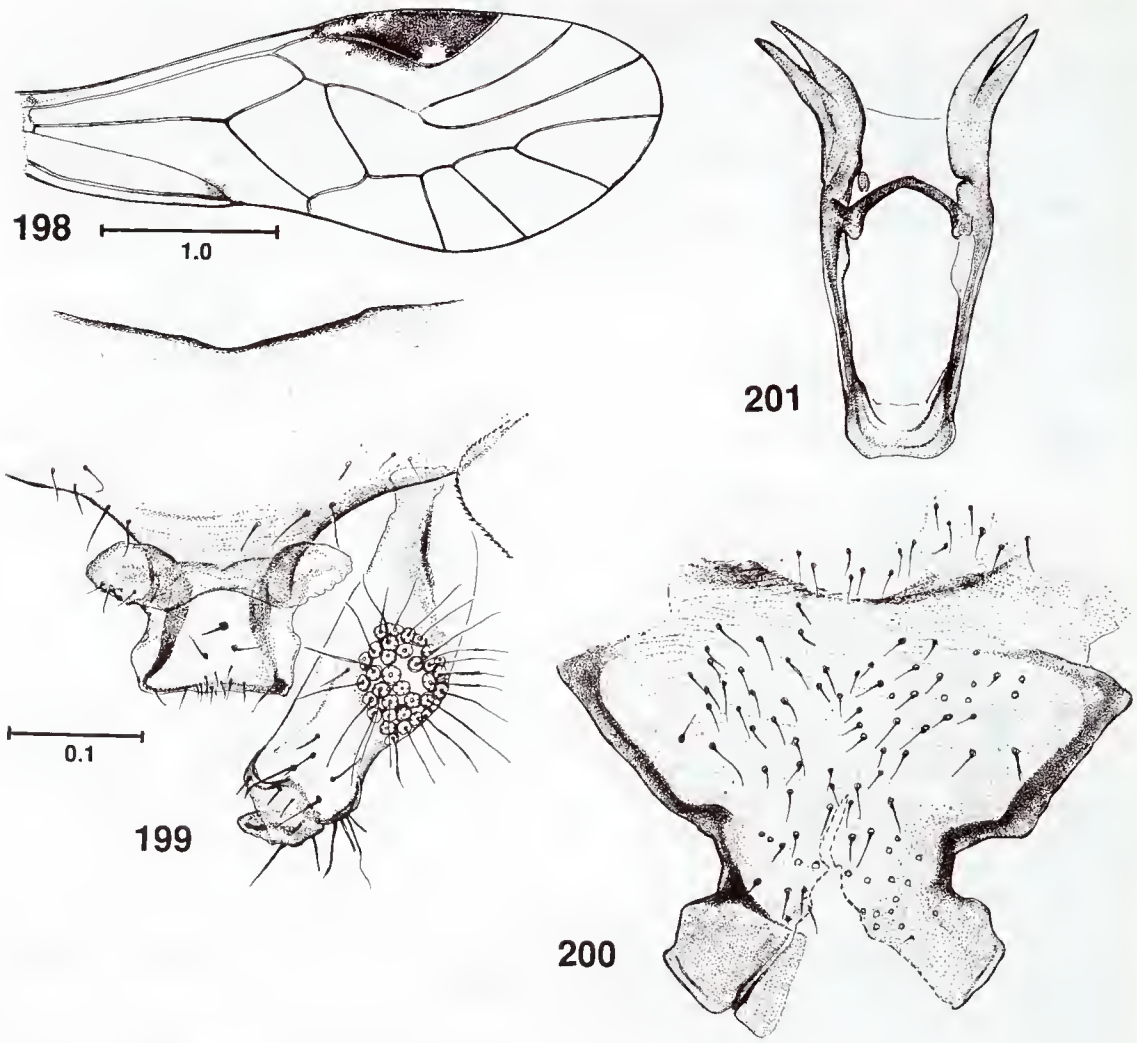
generally pale, those bounding areola postica, marginal medial cells and cell R_3 brown. Hind wing (fig. 194) with slight brown infuscation in cell R_3, apical angle of R_1, and apical third of anal cell; veins pale apart from apical sections of r_{2+3}, r_{4+5} and m and distal branch of vein $m+cu$ brown. Basal half of costal vein with hyaline and brown stretches. Abdomen cream with dark brown annulations.

Morphology. IO:D = 2.0. Claw with subapical tooth. No spurvein on pterostigma. First section of vein cu_{1a} longer than second but approximately in line with it. Epiproct (fig. 195) as in *Clematostigma maculiceps* but posterior transverse bars do not meet, 2 extremely long setae each side of posterior margin. Ninth abdominal tergite (fig. 195) with 3 raised reticulatedly sclerotised areas. Paraproct (fig. 195) with oval field of 30 trichobothria with bare area centrally. Subgenital plate (fig. 196) as in *C. maculiceps*. Gonapophyses (fig. 197): ventral and dorsal valves pointed, dorsal valve with a slight lobe some distance from apex; outer valve setose with tapering posterior lobe. Spermathecal plate (fig. 197) with heavily sclerotised ring.

Dimensions. B 2.9, FW 3.95, HW 2.74, F 0.67, T 1.38, t_1 0.292, t_2 0.166, rt 1.8:1, ct 18, 4, f_1 0.816, f_2 0.883.

Description of male. Coloration (after ca 6 mo in alcohol). As female except transverse fascia of fore wing (fig. 198) represented only by dark pigment in apical angle of cell Cu_2 and darkening of veins at distal end of vein $m+cu$; hyaline window at vertex of pterostigma larger.

Morphology. IO:D = 0.5. Posterior margin of ninth tergite (fig. 199) sclerotised and produced posteriorly as sclerotised base for epiproct. Epi-



Figures 198–201. *Clematostigma lunulata*. Male: 198, forewing; 199, epiproct and paraproct; 200, hypandrium; 201, phallosome. Figures 199–201 to common scale.

proct (fig. 199) with basal lateral lobes each bearing 8-9 small fine setae, a pair of heavily sclerotised skeletal rods diverging posteriorly to straight apical margin; 3 setae on surface of epiproct and a group of about 16 small setae along posterior margin concentrated medially. Paraproct (fig. 199) with circular field of about 40 trichobothria and an apical sharply pointed hook. Hypandrium (fig. 200) setose, posterior margin heavily sclerotised, posteriorly bilobed with anteriorly reflected flaps, the margins of which are also sclerotised. Phallosome (fig. 201) in general form similar to that of *C. maculiceps* but angular anteriorly and outwardly curved; outer parameres apically split, sharply pointed.

Dimensions. B 2.5, FW 3.69, HW 2.77, F 0.65, T 1.43, t_1 0.348, t_2 0.154, rt 2.3:1, ct 21, 4, f_1 0.960, f_2 1.018.

Remarks. This species appears to be confined to *Melaleuca* scrub and coastal vegetation.

C. lunulata is placed in *Clematostigma* Enderlein, as revised by Smithers (1983), in spite of the complete lack of a pterostigmal spur vein, because of its basic similarity, in features of male and female genitalia, to the type species, *C. maculiceps* (Enderlein), also found at Wilsons Promontory. The peculiar structure of the hypandrium and phallosome warrant this placement and therefore the presence of a spur vein on the pterostigma cannot be regarded as a gen-

eric character applying to all species (see key of Smithers, 1983: 79). It should also be noted that the first and second sections of vein cu_{1a} are almost in line. This feature together with the characteristic hyaline window near the vertex of the pterostigma easily distinguishes *C. lunulata* from *C. maculiceps*.

Clematostigma maculiceps (Enderlein)

Copostigma maculiceps Enderlein, 1903: 231.
Clematostigma maculiceps. — Enderlein, 1906: 403.

Material examined. 11♀, 1♂: site 39.

Remarks. Recently redescribed by Smithers (1983), the species was hitherto known from NSW (Sydney region) and Flinders Island, Bass Strait.

Clematostigma striata sp. nov.

Figures 202–207

Material examined. Holotype ♀: Millers Landing, shore vegetation, 21 Apr 1984 (K73711).

Description of female. Coloration (after ca 6 yr in alcohol). Body color generally pale cream. Posterior vertex with light brown markings extending anteriorly each side of epicranial suture and along edge of orbit. Epicranial suture dark brown. Ocelli pale with black centripetal borders, protuberance pale. From each posterior ocellus a curved grey-brown band slightly wider than diameter of ocellus extends along anterior of vertex towards anterior edge of orbit; from anterior ocellus each side a straight grey-brown band gradually widening laterally extends towards antennal socket; a similar grey-brown band along anterior border of frons surrounds antennal socket. Eyes black, gena unmarked. Apical segment of maxillary palp shading to dark grey-brown apically. Postclypeus with striae of distinct small brown spots leaving an unmarked hemispherical area anteriorly. Anteclypeus and labrum pale. Antenna pale (only 2 flagellar segments). Mesothoracic dorsa very dark brown anteriorly, metathoracic dorsa somewhat paler; side of thorax wholly pale except a narrow longitudinal grey-brown band above bases of coxae. Legs pale apart from a narrow subapical ring on tibia, and apex of t_1 and whole of t_2 grey-brown. Fore wing (fig. 202) with basal fascia not extending anterior to vein *m+cu*. Stigmasac brown, a grey-brown mark outside vertex of pterostigma and basal to spur vein, apex of pterostigma with a brown patch. Hind wing (fig. 203) with apical half of cell Cu_2 pale brown. Abdomen pale with granulated grey-brown markings.

Morphology. IO:D = 3.0. Mesothoracic pronotum highly polished. Pterostigma with distinct spur vein, first and second sections of veins cu_{1a} of fore wing in line. Claw with preapical tooth. Epiproct (fig. 204) rounded apically with 4 long setae on apical margin, broadly based with internal transverse sclerotised bars not meeting in midline. Paraproct (fig. 204) with a circular field of 30 trichobothria. Subgenital plate (fig. 205) with apical lobe elongate, broadening distally, a field of fine spicules near apical margin and a subapical field of 10 short setae; lobe with a pair of longitudinal sclerotised tracts, fusing at base of lobe as part of sclerotised area of disc, which is heavily setose. Gonapophyses (fig. 206): ventral valve elongate, acuminate; dorsal valve elongate, narrowing abruptly to short pointed apex; outer valve with very short conical posterior lobe. Spermathecal plate (fig. 207).

Dimensions. B 3.6, FW 4.51, HW 3.30, F 0.86, T 1.81, t_1 0.490, t_2 0.150, rt 3.3:1, ct 21, 3.

Male. Unknown.

Remarks. Based on a single female, the species is nevertheless clearly distinguishable from its Australian congeners. In female genitalia it resembles *C. maculiceps*, although the outer valve posterior lobe is much smaller. The gonapophyses of *C. striata* are more similar to *maculiceps* than are those of *C. lunulata*, although the latter's subgenital plate is closer to the type species. *C. striata* has a pterostigma spur vein (in contrast to *C. lunulata*), but the shape of the areola postica is more similar to *C. lunulata* than it is to *C. maculiceps*. This species can be distinguished from *lunulata* and *maculiceps* by the three dark parallel lines between the ocellar protuberance and the clypeus, and by the shape of the transverse fascia of the fore wing, which is very broad in cell Cu_2, narrow in cell Cu_1, and entirely absent anterior of vein *m+cu*. It is also distinctive in the pattern of pigmentation of the sides of the thorax and of the legs.

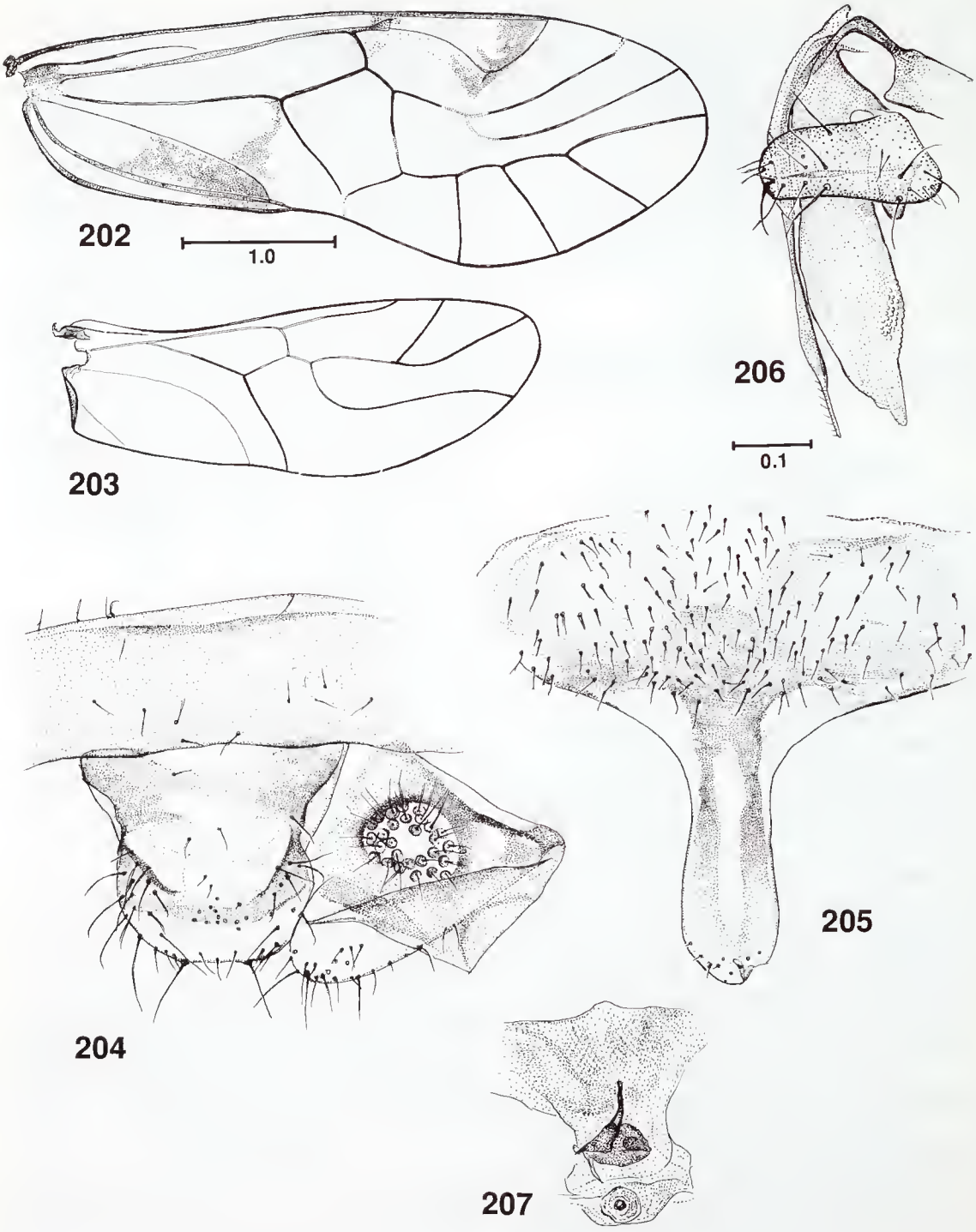
Ptycta Enderlein

Ptycta Enderlein, 1925: 102. Type species: *Psocus haleakalae* Perkins.

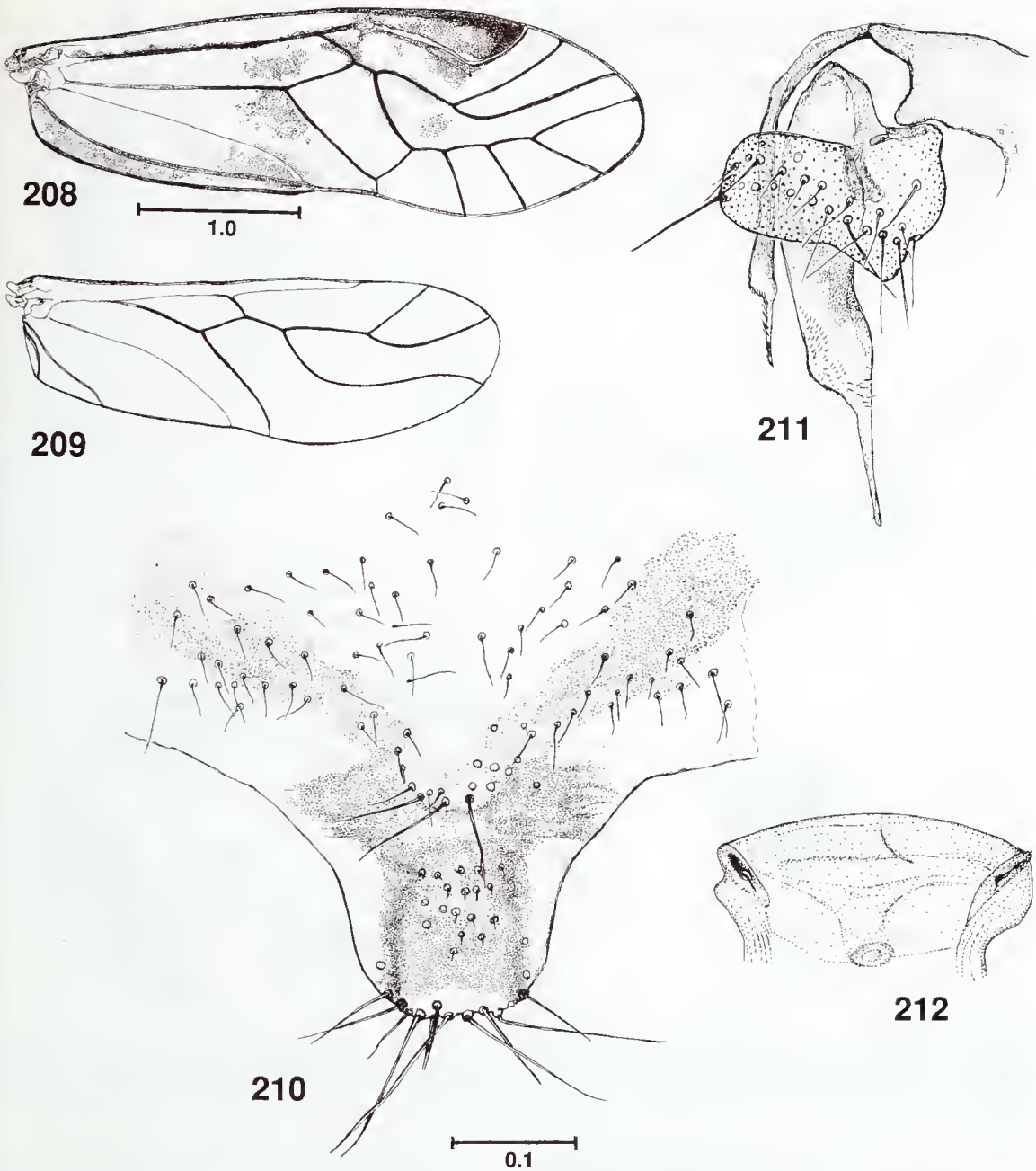
Ptycta australis sp. nov.

Figures 208–217

Material examined. Holotype ♀: Darby Beach Track, coastal dune vegetation, 29 Sep–1 Oct 1985; allotype ♂, Lilly Pilly Nature Track, closed heath, 15–16 Dec



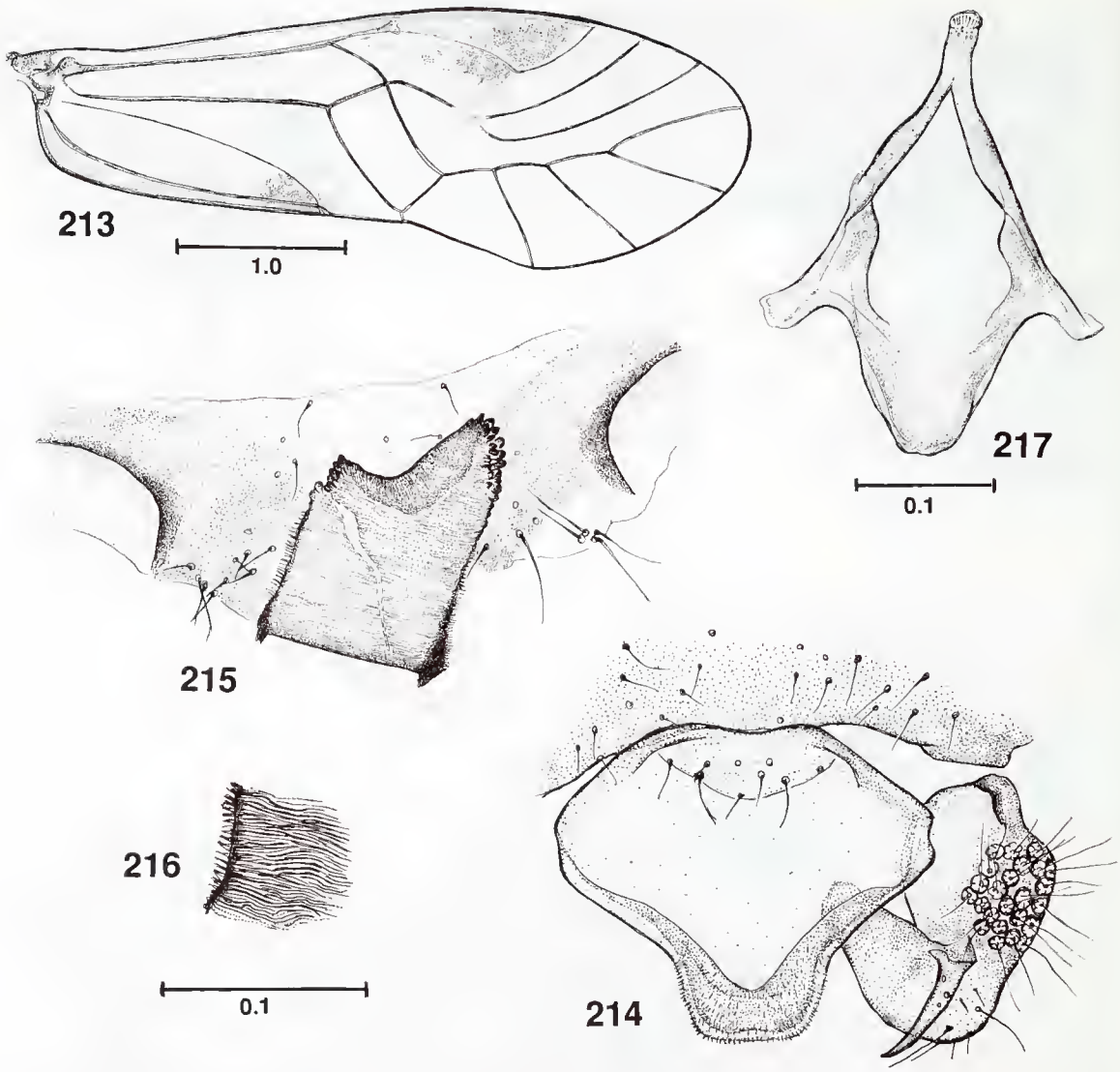
Figures 202–207. *Clematostigma striata*. Female: 202, forewing; 203, hindwing; 204, epiproct and paraproct; 205, subgenital plate; 206, gonapophyses; 207, spermathecal plate. Figures 202, 203 and 204–207 to common scales.



Figures 208–212. *Ptycta australis*. Female: 208, forewing; 209, hindwing; 210, subgenital plate; 211, gonapophyses; 212, spermathecal plate. Figures 208, 209 and 210–212 to common scales.

1985; 4 nymphs, 2♀ paratypes: same locality as allotype, 20–21 Nov 1985 (K73712–K73715). Specimen on which fig. 214 of male epiproct based: Mt William National Park, north-east Tasmania, heath, 7 Dec 1986. Additional records (17♀, 9♂, 6 nymphs): site 4 (May 1985), site 14 (Apr 1990), site 20, site 36, site 41, site 42.

Description of female. Coloration (after ca 5 yr in alcohol). Ground color of head, cream; small adjacent dark brown markings on vertex dorsal to eyes, across posterior and beside epicranial suture. Eyes dark grey. Ocelli with centripetal edges bordered black. Gena with row of 3 or 4 brown patches below orbit. Scape and pedicel cream, flagellum brown. Frons with brown stirrup mark anterior to ocelli and brown spot half



Figures 213–217. *Ptycta australis*. Male: 213, forewing; 214, epiproct and paraproct of Tasmanian specimen; 215, hypandrium; 216, surface of tongue of hypandrium; 217, phallosome. Figures 214, 215 and 217 to common scale.

way between this and antennal socket. Frons-clypeal suture black. Postclypeal striae grey. Apical segment of maxillary palp pale buff, extreme apex dark brown. Antedorsum and dorsa of mesothorax cream, posterior margins of antedorsum and mesad margins of dorsa narrowly bordered brown, dorsa of metathorax brown, thoracic pleura brown. Legs cream except: coxa brown, femur with brown ring basally and subapically, tibia dark brown at extreme apex, basal tarsal segment brown, apical segment darker. Fore wing with brown pigment as fig. 208. Hind wing (fig. 209) hyaline with brown cloud in distal angle of cell Cu_2. Abdomen dorsally with broad grey-brown annulations.

Morphology. IO:D = 3.0. Eyes offstanding posteriorly. Epiproct very similar to *Ptycta hollowayae* Smithers, with 2 very long setae near each posterior corner and row of 5 setae along posterior margin. Paraproct with circular field of 22 trichobothria. Subgenital plate (fig. 210). Gonapophyses (fig. 211). Sclerotisation of spermathecal plate (fig. 212).

Dimensions. B 3.0, FW 3.30, HW 2.57, F 0.68,

T 1.45, t_1 0.391, t_2 0.197, rt 2.0:1, ct 19, 0, f_1 0.671, f_2 0.585.

Description of male. Coloration (after ca 5 yr in alcohol). As female with following exceptions: basal flagellar segment and basal three-quarters of f_2 as rest of flagellum; fore wing (fig. 213) with less extensive brown clouds, no trace of transverse fascia. Hind wing hyaline.

Morphology. IO:D = 3.8. Epiproct (fig. 214 – from Tasmanian specimen, anterior margin facing posterior direction) similar to that of *Ptycta hollowayae*, but ratio of greatest width of epiproct to width of basal lobe greater. Paraproct (fig. 214) with large terminal spine, 4 setae over middle third of outer edge sited on sclerotised marginal low prominences giving margin of spine a slightly serrate appearance from some angles; circular field of about 33 trichobothria. Hypandrium (fig. 215, folded) with strap-like tongue bearing row of fine pointed teeth along margin, these becoming broader, with more rounded apex, and in double row towards distal end of tongue; apex of tongue asymmetrically curled; surface of tongue rugose, with close-set anastomising sinuous microscopic transverse ridges (fig. 216); each side of tongue a sclerotised curved bar protruding from surface of sclerite as a low point. Phallosome (fig. 217).

Dimensions. B 2.7, FW 3.91, HW 3.07, F 0.71, T 1.56, t_1 0.466, t_2 0.201, rt 2.3:1, ct 24, 4, f_1 0.845, f_2 0.691.

Remarks. Predominantly found in *Melaleuca* scrub and heath at Wilsons Promontory, *Ptycta australis* differs from its close congeners *Ptycta glossoptera* New and *P. hollowayae* in the extensive pigmentation of the female fore wing. *P. hollowayae*'s fore wing has pigmentation only in the anal cell as a broken transverse fascia, and brown clouds associated with the pterostigma. Fore wings of *P. glossoptera* and *P. australis* have, in addition, pigmented clouds associated with veins *m*, *rs*, and the section of vein *r* immediately basal to its fusion with *m*; in both these species also there is a brown cloud in cell R_5 between the junction of the radial fork and the areola postica. *P. australis* differs from *P. glossoptera* in that the clouds on the *media* and in cell R_5 are absent in the male fore wing, and the broken transverse fascia is broader and more extensively pigmented in the female. The outer valve of the female gonapophyses of *P. australis* has a short triangular posterior lobe intermediate in size between those illustrated for the other two species. The sclerotisation of the ninth sternite of the female differs in details from that of *P. hollowayae*. *P. australis* is also, in general, smaller than the other two species.

Ptyeta campbelli sp. nov.

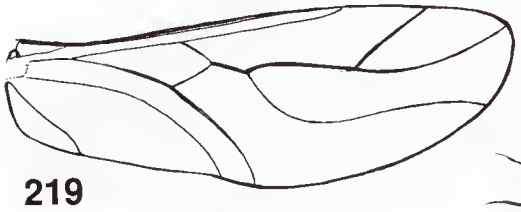
Figures 218–226

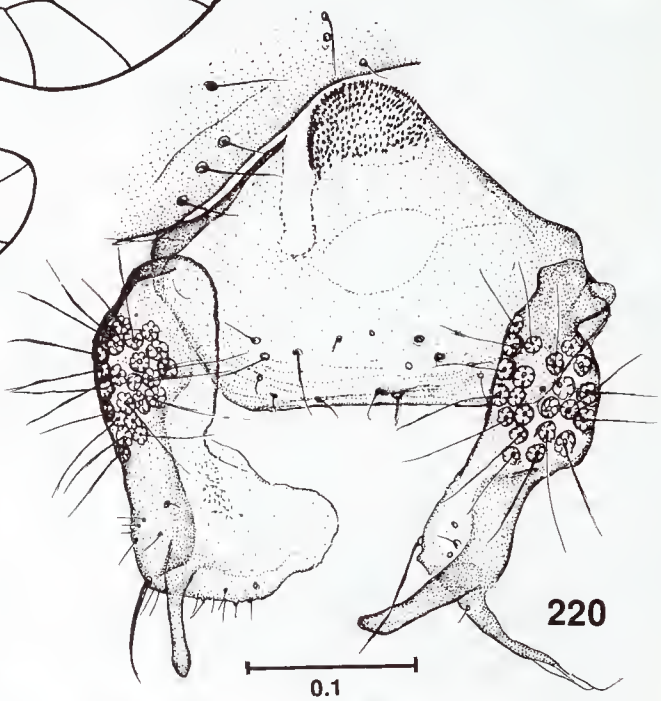
Material examined. Holotype ♂: Darby Beach Track, coastal dune vegetation, 12–14 May 1985; allotype ♀: Telegraph Saddle, low eucalypt woodland, 22–25 Jan 1985; 5 nymphs, 2♀ and 1♂ paratypes: holotype locality, 20–21 Nov 1985 (K73716–K73720). Additional records (83♀, 21♂, 48 nymphs): site 2 (Mar, Apr, Nov, Dec 1985, Jan, Feb 1986), site 3 (Jan, Feb 1985), site 4 (Nov 1985, Jan, Feb 1986), site 5 (Dec 1985), site 6 (Mar 1985), site 9 (Mar, Apr, Nov, Dec 1985, Jan, Feb 1986), site 10 (Apr, May, Nov, Dec 1985, Jan, Feb 1986), site 11 (Nov 1985, Feb 1986), site 12, site 13, site 15 (Apr 1984, Jan 1985), site 16, site 20, site 21, site 22, site 23, site 24, site 25, site 26, site 37, site 40, site 42, site 43, site 44.

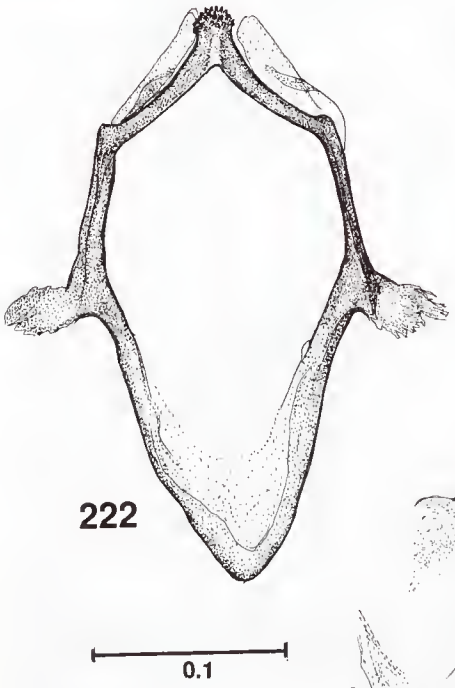
Description of male. Coloration (after ca 5 yr in alcohol). Head cream with dark brown markings as follows: patches behind eyes, along posterior of vertex, each side of epicranial suture and mesad of orbits. Median epicranial suture black. Ocellar protuberance brown, ocelli with black marginal pigment, a brown spot each side of protuberance. Eyes black. Vertex-frons suture broadly margined brown, a median brown stirrup mark on vertex and brown pigment covering each lateral quarter of vertex. Gena with curved brown mark below orbit. Clypeal striae distinct. Labrum brown. Maxillary palp apical segment dark brown. Scape and pedicel brown, f_1 brown darkening distally, rest of flagellum dark brown. Mesothoracic pronotum and anterior half of dorsal lobes pale brown, posteriorly dorsal lobes brown; a dark brown mesial suture on mesothorax widely bordered cream, scutellum pale; metathoracic dorsal lobes brown; thoracic pleura brown. Legs cream except coxa, apex of tibia and tarsal segments brown, femur with subapical brown band. Fore wing (fig. 218) with brown markings; hind wing (fig. 219) hyaline. Abdomen with grey-brown granular markings forming indistinct annuli.

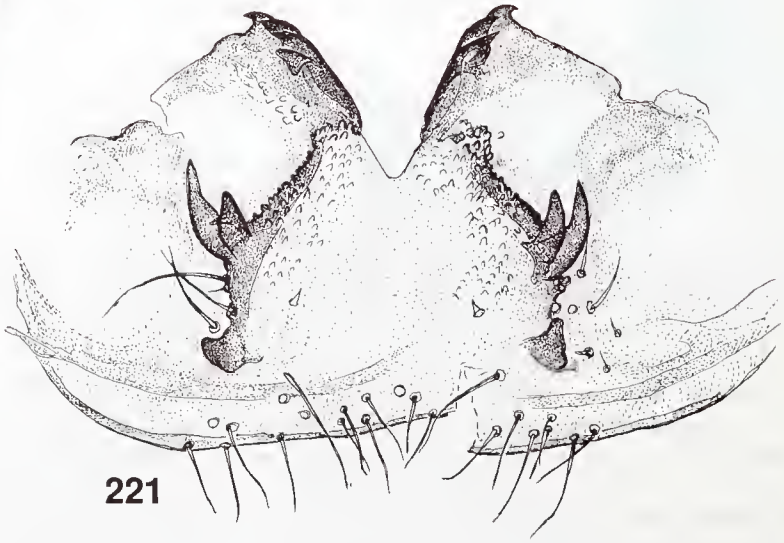
Morphology. IO:D = 3.7. Epiproct (fig. 220) with finely spinous anterior lobe. Paraproct (fig. 220) with oval field of 27 trichobothria. Hypandrium (fig. 221): median tongue with row of 4 large curved spines each side, a tract of fine spinelets with a pair of very large spines towards base of tract, a large squat blunt spine at base each side. Phallosome (fig. 222) less heavily sclerotised apically.

Dimensions. B 2.4, FW 3.73, HW 2.76, F 0.664, T 1.534, t_1 0.458, t_2 0.134, rt 3.42:1, ct 23, 3, f_1 0.798 f_2 0.735.

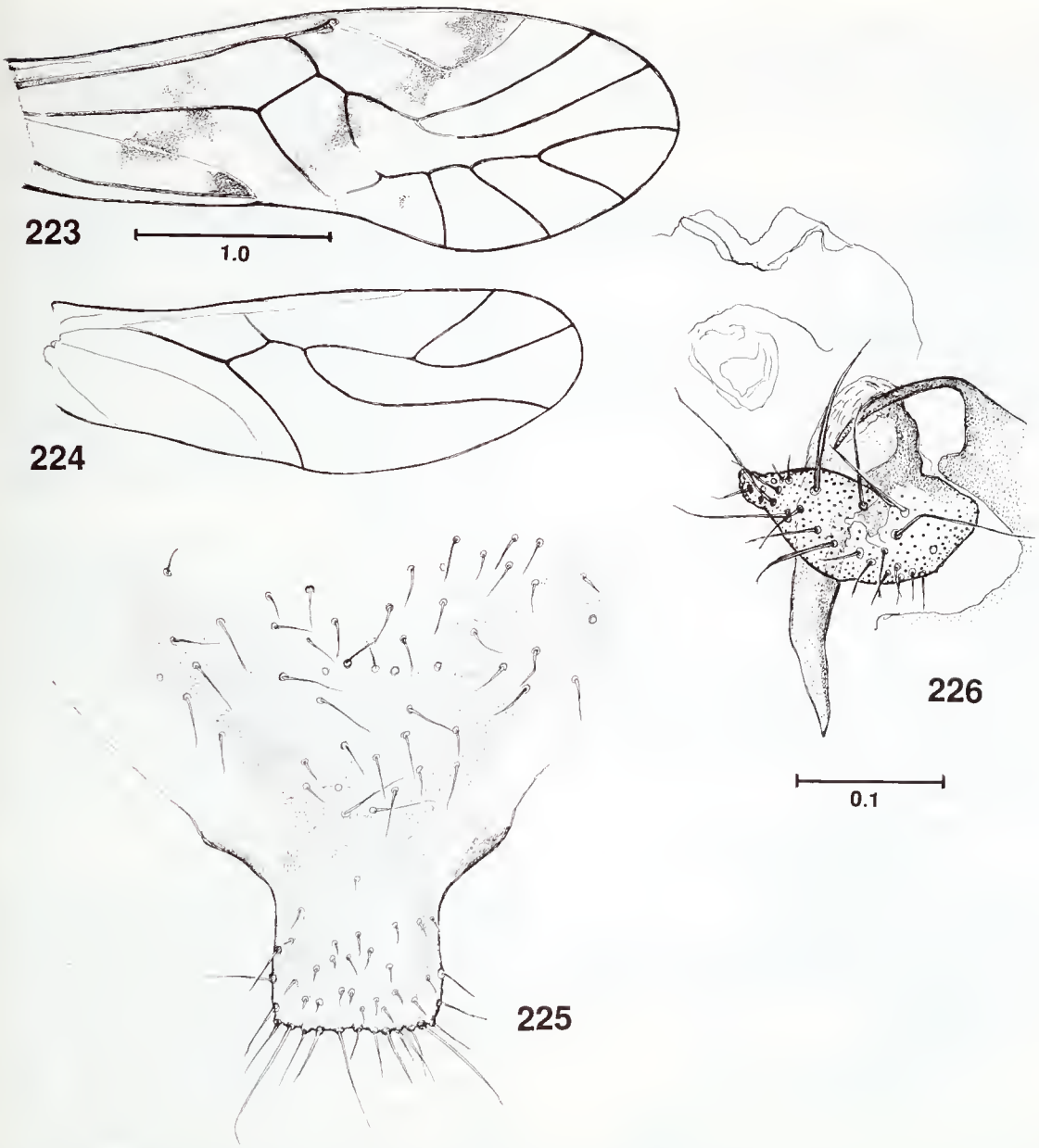








Figures 218–222. *Ptycta campbelli*. Male: 218, forewing; 219, hindwing; 220, epiproct and paraprocts; 221, hypandrium; 222, phallosome. Figures 218, 219 and 221 and 222 to common scales.



Figures 223–226. *Ptycta campbelli*. Female: 223, forewing; 224, hindwing; 225, subgenital plate; 226, gonapophyses and spermathecal plate. Figures 223, 224 and 225 and 226 to common scales.

Description of female. Coloration (after ca 5 yr in alcohol). Head as male except frons with brown spot anterolaterally and another at anterolateral angle. Clypeus with semi-circular paler area each side anteriorly. Fore wing (fig. 223) patterned very much as male, pterostigma less extensively pigmented. Hind wing (fig. 224).

Morphology. IO:D = 4.6. Epiproct setose. Paraproct with circular field of 26 trichobothria. Subgenital plate (fig. 225) with Y-shaped pattern of sclerotisation, a line of long and medium length setae on posterior margin and posterior quarter of lateral margin of apical lobe; scattered short setae on apical lobe. Gonapophyses (fig. 226): ventral valve short, membranous; dorsal valve with sclerotised and membranous

portions, outer valve spindle-shaped, covered with very long setae. Spermapore plate (fig. 226) with complex pattern of sclerotisation.

Dimensions. B 3.0, FW 3.69, HW 2.83, F 0.678, T 1.445, t_1 0.395, t_2 0.150, rt 2.63:1, ct 24, 3, f_1 0.711, f_2 0.671.

Etymology. This species is named after Scott Campbell, Head Ranger of Wilsons Promontory National Park, for his assistance with this project.

Remarks. Characteristics of wing pattern and the hypandrium are distinctive. The species occurs in almost all vegetation types at Wilsons Promontory (it was not taken in mangroves).

Ptycta glossoptera New

Ptycta glossoptera New, 1974b: 302.

Material examined. 33♀, 12♂, 29 nymphs: site 1 (Jul. Dec 1985), site 3 (Mar 1985, Jan, Feb 1986), site 4 (Nov 1985), site 10 (Jan 1985, Feb 1986 — nymph only), site 14 (Apr 1984, Apr 1990, Jan 1991), site 15 (Jan 1985), site 20, site 22, site 23, site 29, site 32, site 36, site 42.

Remarks. This species, predominantly found in heath, scrub and coastal vegetation, was originally described from Wilsons Promontory. It has also been recorded from South Australia and the Bass Strait islands.

Ptycta muogamarra Smithers

Ptycta muogamarra Smithers, 1977: 288.

Material examined. 2♀, 1♂: site 42.

Remarks. This is the first record of the species since it was described from Muogamarra, near Sydney, NSW. Found here in closed scrub (on *Kunzea ambigua*).

Ptycta prosta sp. nov.

Figures 227–232

Material examined. Holotype ♀: Lilly Pilly Nature Track, closed heath, 15–16 Dec 1985 (K73721).

Description of female. Coloration (after ca 5 yr in alcohol). General body color pale buff. Vertex with sparse but distinct brown spots dorsal to each eye, across posterior of vertex, and flanking pale epicranial suture. Ocellar protuberance pale, ocelli pale, centripetally margined black. Eyes black. From anterior ocellus a brown V extends to dark brown frons-clypeal suture. Gena unmarked. Apical segment of maxillary palp brown in apical third. Antenna: scape, pedicel, f_1 and basal four-fifths of f_2 very pale buff, remainder of flagellum brown. Postclypeus with very narrow striae, 3 small brown spots in line just anterior to frons-clypeal suture each side mesad of antennal socket. Anteclypeus and labrum pale. Antedorsum and mesothorax pale buff, dorsal lobes very pale except posteriorly and mesially margined brown; metathoracic dorsa brown, each with a central pale buff spot; sides of thorax pale apart from mesothoracic epimeron and postnotum and metathoracic episternum brown. Legs pale buff apart from basal two-thirds of coxa, a mark on basal fifth of femur, a subapical brown ring on femur, apex of tibia and whole of tarsus brown. Fore wing (fig. 227) with interrupted transverse fascia and distinctive brown markings. Hind wing (fig. 228) hyaline apart from a light brown cloud over apex of cell Cu_2. Abdomen with distinct grey-brown annulations, these broadening and fusing along midline dorsally.

Morphology. IO:D = 4.0. Eyes offstanding posterior margin of vertex. No spur vein on pterostigma. Epiproct (fig. 229). Paraproct (fig. 230) with oval field of 21 trichobothria. Subgenital plate (fig. 231). Gonapophyses (fig. 232) with ventral valve broad basally, narrow in basal third, short; dorsal valve rather narrow; outer valve without posterior lobe.

Dimensions. B 3.2, FW 3.33, HW 2.57, F 0.66, T 1.43, t_1 0.371, t_2 0.197, rt 1.9:1, ct 17, 3, f_1 0.691, f_2 0.592.

Male. Unknown.

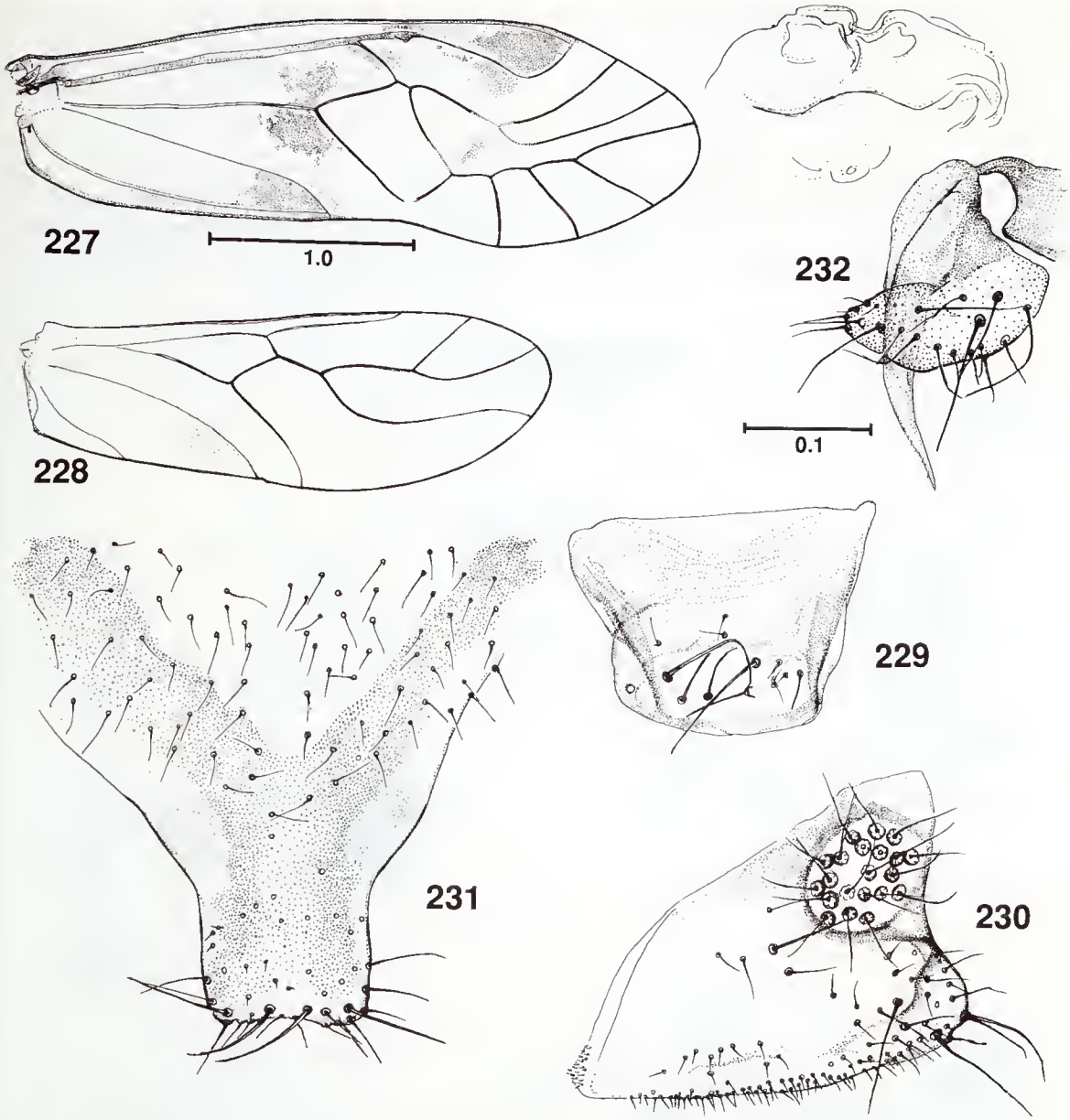
Remarks. Based on a single female, the fore wing pattern is distinctive. In general pattern of female fore wing *P. prosta* resembles females of *P. glossoptera* and *P. australis*, also found at Wilsons Promontory. It differs from both, however, in the pattern of pigmentation in the anal cell; in contrast to these two species, in *P. prosta* the anal cell is pale basally, darkest midway and light brown apically. A very short ventral valve is also found in *Ptycta emarginata* New (WA), *Ptycta umbrata* New (below, also occurring at Wilsons Promontory) and *P. campbelli* (above, also occurring at Wilsons Promontory), but all these species are distinct from *P. prosta* on wing pattern.

Ptycta umbrata New

Ptycta umbrata New, 1974b: 297.

Material examined. 2♀, 5♂, 12 nymphs: site 1 (May 1985, Feb 1986), site 18.

Remarks. This species, found on *Casuarina stricta* and *Banksia integrifolia*, has been recorded from Victoria and South Australia.



Figures 227–232. *Ptycta prosta*. Female: 227, forewing; 228, hindwing; 229, epiproct; 230, paraproct; 231, subgenital plate; 232, gonapophyses and spermathecal plate. Figures 227, 228 and 229–232 to common scales.

Sigmatoneura Enderlein

Sigmatoneura Enderlein, 1908: 761. Type species: *Cerastipsocus subcostalis* Enderlein.

Sigmatoneura formosa (Banks)

Amphigerontia formosa Banks, 1918: 4.
Loensia formosa. — Enderlein, 1924: 35.
Sigmatoneura formosa. — Smithers, 1976: 72.

Material examined. 2♀, 2♂: site 44.

Remarks. Redescribed by Smithers (1976), this species was hitherto known from north Queensland and NSW. It was found here on *Leptospermum laevigatum*.

Tanystigma Smithers

Tanystigma Smithers, 1983: 77. Type species: *Copostigma (Clematostigma) paula* Smithers.

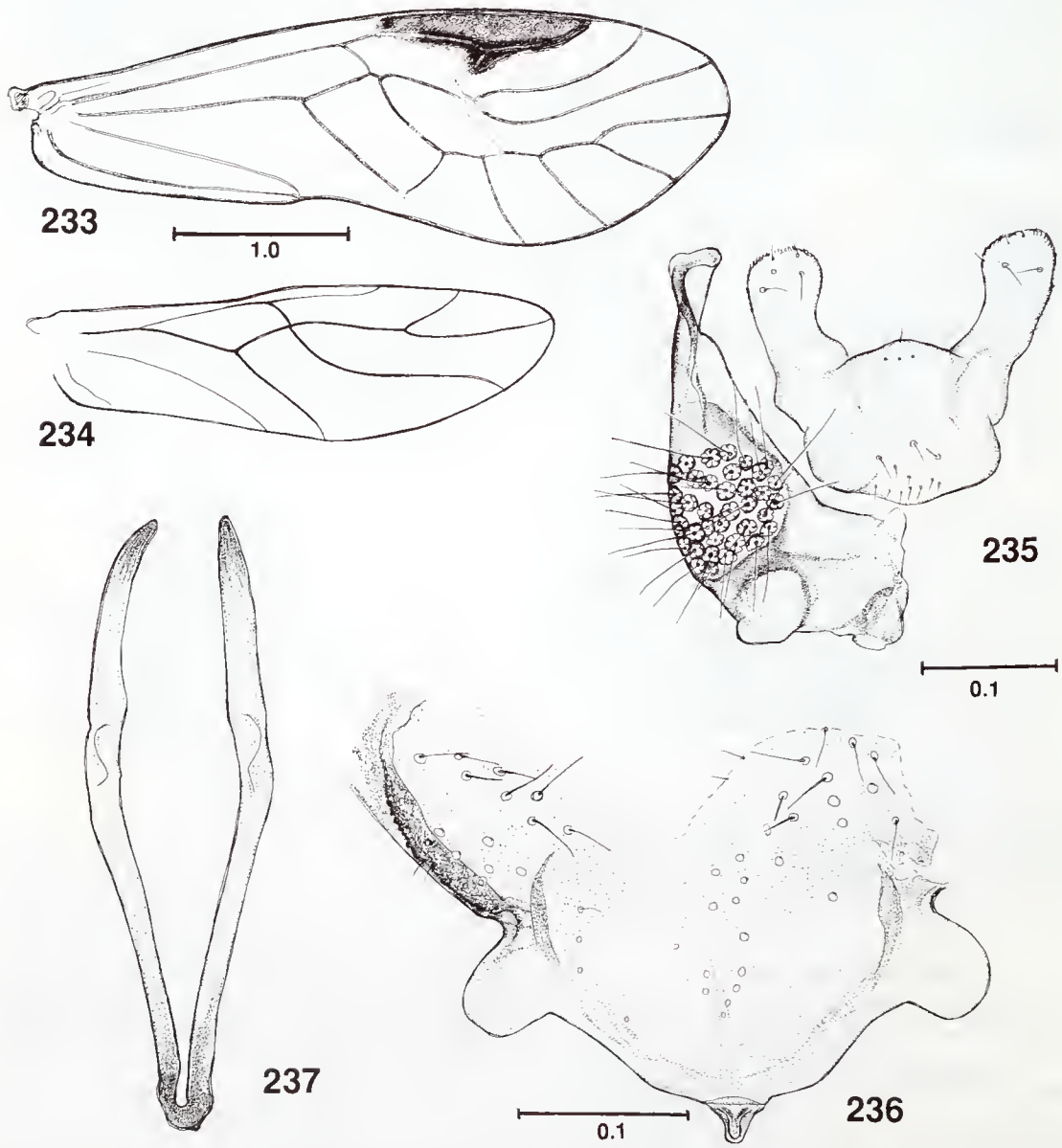
Tanystigma inglewoodense (New)

Figures 233–237

Clematostigma inglewoodense New, 1974b: 296.
Tanystigma inglewoodense. — Smithers, 1983: 77.

Material examined. Specimen on which description based: ♂, Telegraph Saddle, low eucalypt woodland, 12–14 May 1985. Additional records (50♀, 31♂, 37 nymphs): site 2 (Sep, Oct 1985), site 3 (Nov 1985 – nymph only, Jan 1986), site 4 (Apr, May, Nov – nymph only, Dec 1985, Jan 1986), site 5 (Apr 1985), site 10 (Dec 1985), site 12, site 14 (Apr 1984, Apr 1990, Jan 1991), site 20, site 23, site 24, site 27, site 29, site 30, site 31, site 32, site 35, site 36, site 37, site 41, site 42.

Description of male. Coloration (after ca 5 yr in alcohol). As female description (New, 1974b) except: frons with brown stirrup mark anterior to ocelli; a grey-brown streak along posterior suture; clypeus with triangular dark grey-brown



Figures 233–237. *Tanystigma inglewoodense*. Male: 233, forewing; 234, hindwing; 235, epiproct and paraproct; 236, hypandrium; 237, phallosome. Figures 233, 234 and 235 and 237 to common scales.

mark mesad of antennal socket; thoracic terga brown (these differences are also apparent in females of our collection, except the frontal streak is narrower than in the male, and the dark band on femur is subapical, not apical in both sexes). Fore wing (fig. 233) without transverse fascia. Hind wing fig. 234.

Morphology. IO:D = 4.5 Pterostigma more elongate than in female, spur vein half way along its length. Epiproct (fig. 235) with row of 4 subapical setae, membraneous, with long anterior lateral lobes bearing scattered setae. Paraproct (fig. 235) with rounded field of 35 trichobothria. Hypandrium (fig. 236) with apical sclerotised peg, a pair of lateral rounded lobes, margin basal to lobes heavily sclerotised. Phallosome (fig. 237) with parameres anteriorly joined, apically pointed and apparently jointed one-third length from apex.

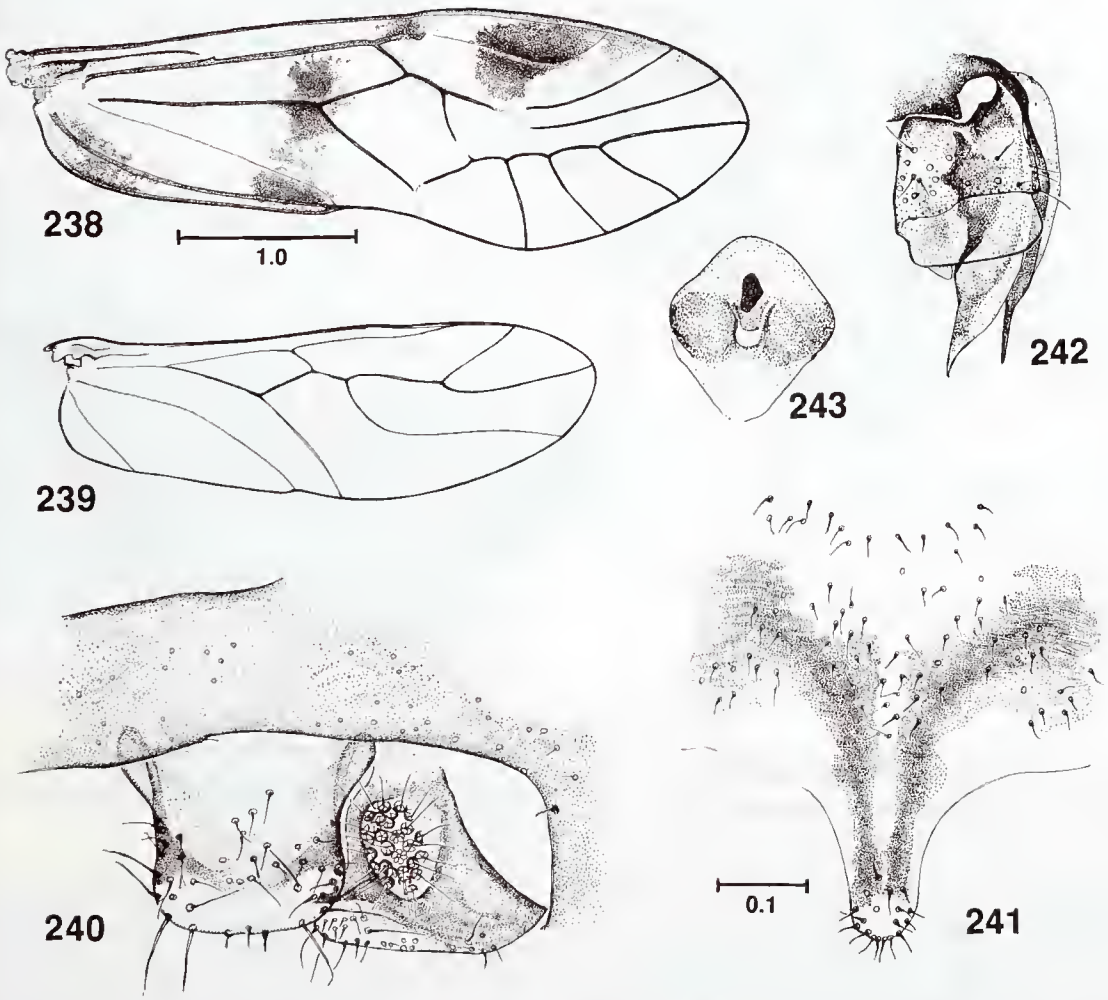
Dimensions. B 2.6, FW 4.06, HW 3.04, F 0.63, T 1.33, t_1 0.379, t_2 0.213, rt 1.8:1, ct 19, 3, f_1 0.902, f_2 0.864.

Remarks. Apart from low eucalypt woodland, the species was collected only in heath and scrub vegetation. Wilsons Promontory is the second locality known for this species, described from a single female near Inglewood, Victoria.

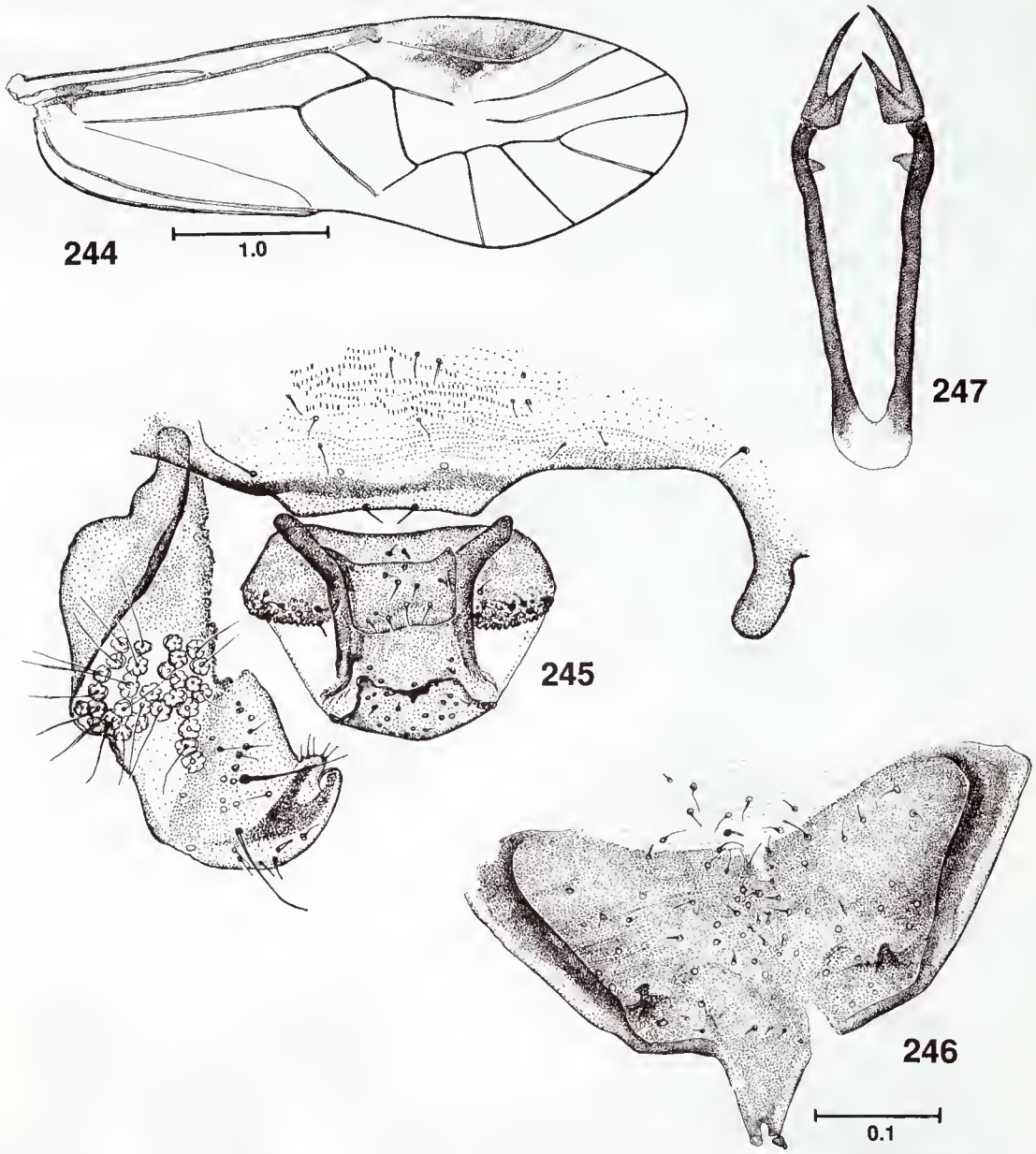
Tanystigma valvula sp. nov.

Figures 238–247

Material examined. Holotype ♀: Lighthouse Walking Track, about 2 km east of Roaring Meg camping area, closed heath, 26 Apr 1989; allotype ♂: same data as



Figures 238–243. *Tanystigma valvula.* Female: 238, forewing; 239, hindwing; 240, epiproct and paraproct; 241, subgenital plate; 242, gonapophyses; 243, spermathecal plate. Figures 238, 239 and 240–243 to common scales.



Figures 244–247. *Tanystigma valvula*. Male: 244, forewing; 245, epiproct, paraproct and ninth tergite; 246, hypandrium; 247, phallosome. Figures 245–247 to common scales.

holotype (K73722, K73723). Additional records (1♀): site 37.

Description of female. Coloration (after ca 1 yr in alcohol). Ground color of head creamy-white with dark brown markings as follows: small merging patches each side of epicranial suture, along posterior of vertex and mesad of orbit; gena with very small dark patches immediately below orbit. Antenna brown. Ocellar protuberance dark brown. Postclypeus with 10 longitudinal striae and 3 short striae angled at margins, anteclypeus and labrum black. Penultimate segment of maxillary palp brown, apical segment black. Eyes black. Mesothoracic terga black, a small cream median line. Metathoracic terga

black with a smaller median cream line anteriorly. Pleura dark brown-black. Fore wing (fig. 238) with a distinct broken transverse fascia and a cloudiness in cell R_1 near wing margin. Hind wing (fig. 239) hyaline, very faint cloud at apical angle of cell Cu_2. Hind leg with coxa, femur and tarsal segments very dark brown, tibia buff, dark brown apically. Abdomen cream with granulated greyish pigment dorsally.

Morphology. IO:D = 3.2. Basal section of vein cu_{1a} of fore wing (fig. 238) longer than apical section, but the 2 almost in line. Epiproct (fig. 240) heavily sclerotised marginally. Paraproct (fig. 240) with oval field of 33 trichobothria. Subgenital plate (fig. 241) with distal area of apical lobe setose and membranous. Gonapophyses (fig. 242) with massive outer valve having rectangular apical lobe as large as rest of valve. Spermapore plate (fig. 243) of distinctive shape and pattern of sclerotisation.

Dimensions. B 3.8, FW 4.09, HW 3.10, F 0.74, T 1.55, t_1 0.340, t_2 0.174, rt 2.6:1, et 15, 4, f_1 0.743, f_2 0.569.

Description of male. Coloration (after ca 1 yr in alcohol). As female except fore wing pigment confined to areola postica and outer margin of cell R_1.

Morphology. IO:D = 1.2. Fore wing (fig. 244) as female but sections of cu_{1a} equal in length. Epiproct (fig. 245) with rectangular basal setose flap and lateral ovoid rugose lobes bearing scattered setae. Ninth tergite with ventrolateral apophyses (fig. 245), hind margin thickened anterior to epiproct. Paraproct (fig. 245) with distinct curved skeletal bar, oval field of 31 trichobothria and sclerotised double claw apically. Hypandrium (fig. 246) apically bifid, terminating in a pair of short, broad pointed spines; on body of hypandrium near posterior lateral angle each side a broad short hook directed anterolaterally. Phallosome (fig. 247) closed anteriorly, but junction not sclerotised, posteriorly open with a pair of double, sharp sclerotised spines.

Dimensions. B 3.5, FW 4.19, HW 3.13, F 0.74, T 1.64, t_1 0.434, t_2 0.190, rt 2.3:1, et 18, 6, f_1 0.727, f_2 0.600.

Remarks. In several features this species appears to be related to *Tanystigma notialis* (Smithers) from Western Australia. The pair of rounded lateral lobes on the male epiproct, the inwardly pointing bifid spines of the phallosome and the membranous apex of the subgenital plate are similar in the two species. In both species also the outer valve of the female gonapophyses is very large. *T. valvula* differs from *T. notialis* in the pigmentation of the fore wing, the restriction of setae to the distal portion of the apical lobe of the subgenital plate, the straight posterior border of the outer valve (sinuous in *T. notialis*) and the bifid hooks of the phallosome (longer than in the Western Australian species). The female is remarkably similar to *Tanystigma bifurcata* Smithers from South Australia in the form of the subgenital plate, the outer valve of the gonapophyses and the pattern of pigment of the fore wing. The male, which like that of *T. bifurcata* (and *T. notialis*) has bifid spines at the apex of the phallosome and (not mentioned in *T. notialis*) ventrolateral apophyses on the ninth tergite, differs however from *T. bifurcata* in details of the structure of the phallosome, epiproct and hypandrium. The hooks on each side of the hypandrium at the posterior angles are similar in form and position to those of *Lasiopsocus dicellus* Smithers. The female is also similar to *Tanystigma dubium* (New) (males unknown) from Victoria and Western Australia in the form of the subgenital plate and the outer valve of the gonapophyses. *T. dubium* differs however in the pigmentation of the pterostigma of the fore wing and in lacking the small dorsal lobe of the outer valve of the gonapophyses.

Species known to have single-spined phallosomes [*Tanystigma paula* (Smithers), *Tanystigma latimentula* (Smithers), *Tanystigma elongata* Smithers, *Tanystigma tardipes* (Edwards), *Tanystigma edwardsi* (New) and *T. inglewoodense*] have both sections of vein cu_{1a} of the fore wing meeting at an obtuse angle of clearly less than 180°. Those with double-spined phallosomes (*T. notialis, T. bifurcata* and *T. valvula*) all have both sections of the vein almost in a straight line.

Myopsocidae Enderlein

Myopsocus Hagen

Myopsocus Hagen, 1866: 210. Type species: *Psocus unduosus* Hagen.

Myopsocus australis (Brauer)

Psocus australis Brauer, 1865: 908.
Myopsocus australis. — Kolbe, 1883a: 145. For full synonymy see Smithers (1975).

Material examined. 8♀, 6♂, 2 nymphs: site 1 (Jan, Feb 1986), site 2 (Jan, Feb 1986), site 5 (May 1985), site 7 (Jan 1985), site (Jan 1985), site 27, site 29.

Remarks. This widespread species has been recorded from Tasmania, the Bass Strait islands and all mainland states, but not from the Northern Territory. It was collected here from *Casua-*

rina stricta, low eucalypt woodland, tall open forest, closed scrub and open heath.

Discussion

Species discovery curves have been used in comparable studies of psocopteran faunas, to summarise the progressive discovery of species as more individuals are collected over time. An upper asymptote of the number of species discovered indicates that the area has been thoroughly sampled. Randomising the samples excludes phenological effects on the shape of the curve.

The randomised species-individuals discovery curve (fig. 248) suggests that the vegetation types studied were thoroughly sampled. Small patches of *Nothofagus* in very inaccessible regions of the park were not sampled, and this and perhaps one or two other uninvestigated habitats may well yield species additional to those recorded here. The non-randomised species-individuals discovery curve (fig. 249) illustrates the recent discovery of species in newly-sampled areas with habitats broadly similar to those previously sampled, and suggests that further collecting in other areas may yet turn up additional species. The levelling of the non-randomised curve (fig. 249) indicates that the 11 habitats that were systematically sampled were thoroughly investigated, yielding a total of 55 species. Thirteen additional species were collected on occasions outside the 13-month systematic sampling period (2 species prior and 11 after the period) from habitats outside the area that was systematically intensively sampled (Map B, Table 2). In floristic structure these habitats appear similar to those intensively sampled; however there are undoubtedly minor differences in floristic composition, age, aspect, etc. It is estimated that about 90% of the arboreal psocopteran fauna of Wilsons Promontory is now known.

In other surveys of south-eastern Australia accessibility and other factors have restricted sampling to very small parts of the areas under study (Table 4). At Cape Otway National Park sampling sites were near the eastern fringe of the park, such that large areas of the central region and all the western foreshore were not sampled (Thomas, 1986). At Muogamarra Nature Reserve habitats sampled were confined to the area in or near Peats Crater, a somewhat circular area of about 12 ha (Smithers, 1977). The large size and varied topography of the Grampians area suggests that habitats as yet unsampled there may yield additional species. Mt Arapiles, in contrast, is a small, isolated arid area which appears to have been thoroughly sampled (Endersby et al., 1991).

The eastern block of Cape Otway National Park consists of south-eastern slopes of a ridge (that is generally 500–600 m in altitude) of the Otway Range. It is heavily timbered, the vegetation reflecting the high rainfall in the area — one of the wettest in Victoria (Parsons et al., 1977). This region of the park contains 515 vascular plant species (Beauglehole, 1980) compared to 858 species at Wilsons Promontory; it is lower and about one-fifth the size of Wilsons Promontory. The plant species richness of Flinders I. (more than 800 species) is almost double that of King I. (about 430 vascular plant species) (Edgecombe, 1985; Anon, 1972*b*) and Flinders is 26% larger, less disturbed by humans and is higher than King I. At Wilsons Promontory much of the forest has been greatly modified by fire; many of the tall trees have gone and in their place are now extensive areas of closed scrub. Fire is the dominant factor determining present vegetational distribution patterns. Without fire, Lilly-pilly *(Acmena smithii)* would eventually replace much of the present tall open forest, and myrtle beech *(Nothofagus cunninghamii)* would be more widespread (Smith, 1978). Undoubtedly the extensive areas of various scrub and heath plant communities resulting from fires have increased the complexity of vegetation associations at Wilsons Promontory, the complexity being accentuated by interactions between fire, soil, aspect and vegetation. Parsons (1966) has noted the various soil types and vegetation associations of an area near Tidal River.

The different sizes of the psocopteran faunas of King I. (24 species), western Bass Strait, and Flinders I. (38 species), eastern Bass Strait, coincides with differences between Cape Otway (39 species) to the west and Wilsons Promontory (68 species) to the east (Thomas, 1986; Cole et al., 1989). Although sampling effort differs in each of these areas of Bass Strait, there appears to be a correlation between the number of psocopteran species taken and plant species richness, the latter depending, at least in part, on the varying effects of physical relief and fire in the areas concerned.

Somewhat similar patterns of plant communities are evident in Tasmania, where mountains of the west coast receive a very high rainfall under the influence of the roaring forties and the eastern part of the island is much flatter and drier than the west, some areas approaching the

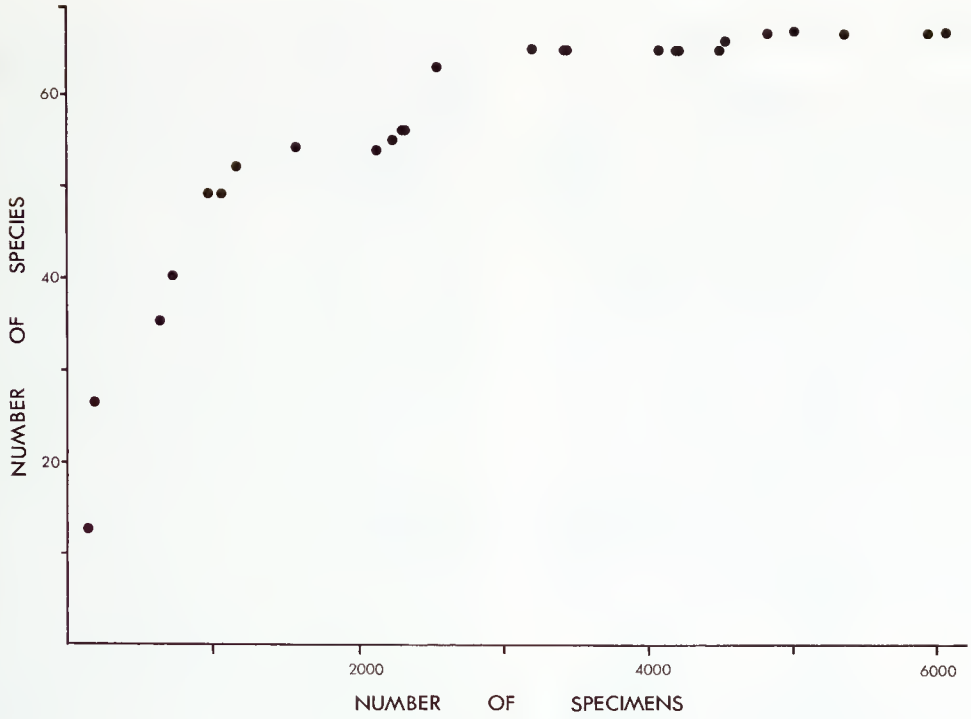


Figure 248. Randomised species-individuals discovery curve of psocopterans at Wilsons Promontory 1982–1991.

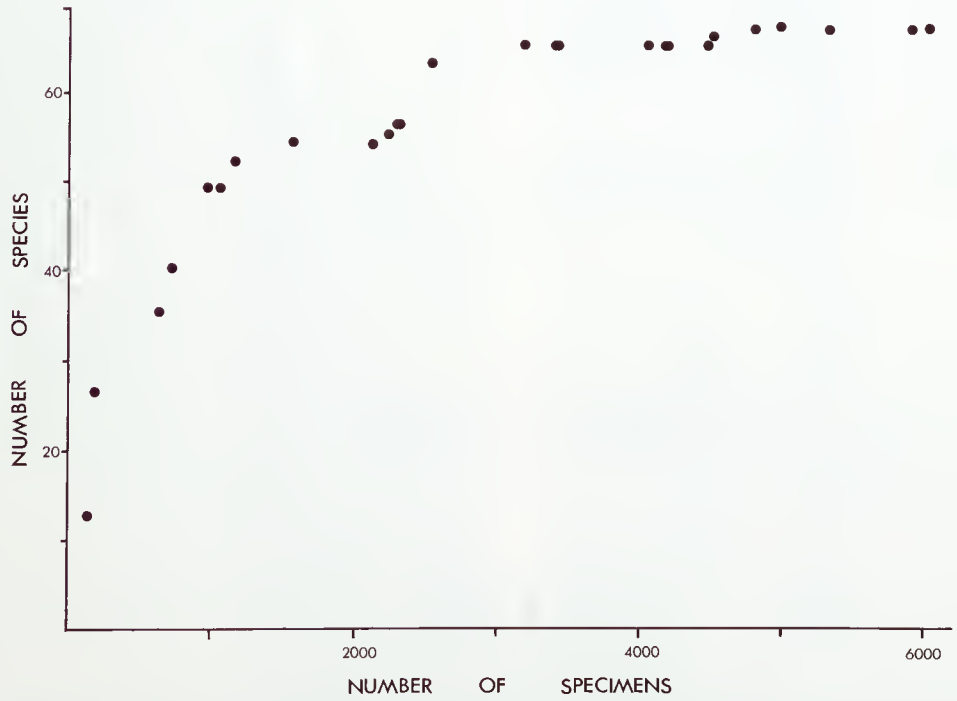


Figure 249. Non-randomised species-individuals discovery curve of psocopterans at Wilsons Promontory 1982–1991. Solid circles indicate data from the systematic survey in 1985 and 1986.

Table 4. Areas of southeastern Australia surveyed for Psocoptera, showing average annual rainfall, species richness (number of genera in brackets) and α diversity.

Region	Wilsons Promontory	Cape Otway	Flinders I.	King I.	Muogamarra	Grampians	Mt Arapiles
Area (ha)	49 000	12 750	137 000	109 000	2 300	167 000	1 500
Rainfall (mm)	1 080	<1 800	650–870	690–1 070	650–950	450–600	
Species (Genera)	68 (25)	39 (14)	38 (18)	24 (14)	43 (24)	32 (15)	
Foliicolous species (genera)	35 (11)	23 (7)	19 (7)	14 (6)	20 (10)	10 (4)	
Corticolous species (genera)	31 (13)	16 (7)	18 (10)	10 (8)	21 (13)	20 (9)	
Total specimens	6 039	763	618	159	684	534	233
α	10.7	8.7	9.0	7.9*	10.2	6.0	2.9*
Period of survey	all year	Feb–Oct	all year		all year	Feb–Nov	
Number of visits	(18)**	(9)	(5)		(23)	(10)	

* Number of specimens too small for reliable α value
** An additional 8 visits were made outside the survey period

low rainfall of Mt Arapiles, Victoria. The vegetation map by Jaekson (1965: 31) emphasiscs the distinetion between the wetter environment of the west with its climax eool-temperate closed forest and the drier east with predominantly dry open forest. On soils of high fertility and rainfall, temperate elosed forest is simple strueturally and floristieally; however, this vegetation becomes more eomplex as a result of interactions between fire frequency and intensity, soil structure and fertility, aspect, and parent rock (Edwards, 1983; Jackson, 1965). Mosaics of closed forest, mixed forest, open eucalypt forests, scrubs, heaths and moorland may predominate in a given area; the number of plant species thus increases with increasing fire frequency and decreasing soil fertility. Without fires, plant eommunities of the west eoast (and north-east highlands) would consist almost exelusively of closed forest (Edwards, 1983). Only thirty-one species of Psocoptera are reeorded from Tasmania, predominantly from the drier open forests of the east and north eoasts (Edwards, 1950; Hiekman, 1934) and several habitats in the south-west (Smithers, 1979). The Tasmanian psocopteran fauna is currently under study; both intensive and extensive sampling has been earried out aeross the island. The correlation, if any, between species richness of Psoeoptera and plants of many different vegetation associations is now under investigation.

The psocopteran α diversity indices of Wilsons Promontory and Muogamarra (Table 4) have been compared with surveys made in other parts of the world (Garcia-Aldrete, 1988), and the indices for islands and archipelagos of the southwest and west Pacific have been compared and discussed by Thornton (1989). The α index is the diversity parameter of the log-series model (Fisher et al., 1943; Southwood, 1978; Taylor et al., 1976). Our data fit a log series (Chi-square tests of goodness fit provide values within the 95% confidence limits of the test) and thus the use of the α index, which also has been used in other studies of psoeopteran faunas over the past decade, is valid. In general, the faunas of the areas surveyed in south-eastern Australia (α in the range 6–11) are more diverse than those of England (α = 1.3) and the highlands of East Afriea and Jamaica (α = 5.7 and 5.0 respectively) but mueh lower than the fauna of lowland regions of Trinidad and Panama (α = 12.8 and 19.6 respectively) (Broadhead, 1983) and Chamela (α = 24.0), an area of deciduous tropieal forest on the west coast of Mexieo where the extremely high species diversity may be related to high floristic diversity (Garcia-Aldrete, 1988).

Foliieolous species (dwelling on living or dead foliage) are comparable in number for Cape Otway, Flinders Island and Muogamarra (Table 4). Their numbers are partieularly high at Wilsons Promontory, however, and low at The Grampians – Mt Arapiles and King I. Cortieolous speeies (bark dwellers) are well represented in all surveys except King I., but again more numerous at Wilsons Promontory. In comparison to other surveys of Psocoptera in southeastern Australia (Table 4) Wilsons Promontory, with 68 species, appears to be the richest of the regions investigated and has the highest diversity. In spite of the more extensive sampling of the promontory than other areas, we believe that the diversity of psocopterans is most probably a reflection of diversity of vegetation assoeiations and hence psocopteran microhabitats available.

Acknowledgements

We are grateful to the National Parks Service for permission to conduct this survey at Wilsons Promontory, to Scott Campbell, Head Ranger, for advice and cooperation, the School of Botany, University of Melbourne for the use of its facilities at Tidal River, and to Ms I. Foley for assistance with arrangements. We also thank the Australian Museum, Sydney, and the Bishop Museum, Honolulu, for the loan of type material in eonneetion with this study. We also wish to thank Ms J. Browning, Ms. J. Kernutt and Mrs T. Carpenter, who made the drawings, and Ms J. Cheah, who typed the manuscript.

References

Aaron, S.F., 1886. On some new Psocidae. *Proceedings of the Academy of Natural Sciences of Philadelphia* 38: 13–18.

Anon., 1972a. *The Ferns and Flowering Plants of Wilsou's Promontory National Park.* (Revised Edition). National Parks Service, Victoria.

Anon., 1972b. Plant list for King Island, Bass Strait *Victorian Naturalist* 79: 287–299.

Anon., 1984. *Discovering the Prom on foot.* National Parks Service, Victoria, and Victorian National Parks Association.

Ashton, D.H. and Frankenberg, J., 1976. Ecological studies of *Acmena smithii* (Poir.) Merrill and Perry with special reference to Wilson's Promontory. *Australian Journal of Botany* 24: 453–487.

Aston, D.H. and Webb, R.N., 1977. The ecology of granite outcrops at Wilson's Promontory, Victoria. *Australian Journal of Ecology* 2: 269–296.

Badonnel, A., 1932. Copéognathes de France (IVe

note). *Bulletin de la Société Entomologique de France* 37: 77–79.
Badonnel, A., 1943. Psocoptères. *Faune de France* 42: 1–164.
Badonnel, A., 1946. Psocoptères du Congo Belge. *Revue de Zoologie et de Botanique Africaine* 39: 137–196.
Badonnel, A., 1955. Psocoptères de l'Angola. *Publicacoes Culturais da Companhia de Diamantes de Angola* 26: 1–267.
Ball, A., 1943. Contribution à l'étude des Psocoptères. III. *Bulletin du Musée Royal d'Histoire Naturelle de Belgique* 19: 1–28.
Banks, N., 1903. Some new neuropteroid insects. *Journal of the New York Entomological Society* 11: 236–243.
Banks, N., 1918. New neuropteroid insects. *Bulletin of the Museum of Comparative Zoology at Harvard College* 62: 1–22.
Banks, N., 1939. New genera and species of neuropteroid insects. *Bulletin of the Museum of Comparative Zoology at Harvard College* 85: 439–504.
Beauglehole, A.C., 1980. *The distribution and conservation of vascular plants in the Coranganite–Otway area, Victoria.* Western Victorian Field Naturalists' Clubs Association: Portland.
Blom, W.M., 1988. Late Quaternary sediments and sea-levels in Bass Basin, southeastern Australia – a preliminary report. *Search* 19: 94–96.
Brauer, F., 1865. Vierter Bericht 'ber die auf der Weltfahrt der kais. Fregatte Novara gesammelten Neuropteren. *Verhandlungen Zoologisch-Botanische Gesellschaft in Wien* 15: 903–908.
Broadhead, E., 1983. The assessment of faunal diversity and guild size in tropical forests with particular reference to the Psocoptera. *British Ecological Society Special Publication* 2: 107–119.
Cole, P.G., New, T.R. and Thornton, I.W.B., 1989. Psocoptera of Flinders, King and Deal Islands, Bass Strait. *Journal of the Australian Entomological Society* 28: 31–38.
Curtis, J., 1837. *British Entomology* 14: 648–651.
Edgecombe, J., 1985. *Flinders Island, the Furneaux Group.* Algona: Melbourne.
Edwards, B.A.B., 1950. A study of the Tasmanian Psocoptera with descriptions of new species. *Papers and Proceedings of the Royal Society of Tasmania* 1949: 93–134.
Edwards, I.J., 1983. Vegetation. Pp. 85–91 in: Gee, H. and Fenton, J. (Eds) *The South West Book* Collins/ACF: Melbourne.
Enderlein, G., 1901. Neue deutsche und exotische Psociden, sowie Bermerkungen zur Systematik. *Zoologischen Jahrbüchern. Abtheilung für Systematik, Geographie und Biologie der Thiere* 14: 537–548.
Enderlein, G., 1903. Die Copeognathen des indo-australischen Faunengebietes. *Annales Historico-naturales Musei Nationalis Hungarici* 1: 179–344.
Enderlein, G., 1905. Morphologie, Systematik und Biologie der Atropiden und Troctiden sowie Zusammenstellung aller bisherbekannten recenten und fossilen Formen. *Results of the Swedish Zoological Expedition to Egypt and the White Nile, 1901,* 18: 1–58.
Enderlein, G., 1906. Die australische Copeognathen. *Zoologischen Jahrbüchern, Abtheilung für Systematik, Geographie und Biologie der Thiere* 23: 401–412.
Enderlein, G., 1908. Die Copeognathenfauna der Insel Formosa. *Zoologischer Anzeiger* 33: 759–779.
Enderlein, G., 1924. Copeognathen. In: Damph, A. (Ed.) Zur Kenntnis der estlandischen Moorfauna (11). *Sitzungsberichte. Gesellschaft Naturforschender Freunde zu Berlin* 31: 34–37.
Enderlein, G., 1925. Beiträge zur Kenntnis der Copeognathen. IX. *Konowia* 4: 97–108.
Enderlein, G., 1931. The Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr J. Stanley Gardiner, M.A. VIII. Die Copeognathen-fauna der Seychellen. *Transactions of the Linnean Society of London (2nd ser. Zoology)* 19: 207–240.
Endersby, N.M., New, T.R. and Thornton, I.W.B., 1990. Psocoptera from the Grampians and Mt. Arapiles, Western Victoria – a biogeographic analysis. *Journal of the Australian Entomological Society* 29: 215–224.
Fisher, R.A., Corbet, A.S. and Williams, C.B., 1943. The relation between the number of species and the number of individuals in a random sample of an animal population. *Journal of Animal Ecology* 12: 42–58.
Garcia Aldrete, A.N., 1988. The psocids (Psocoptera), of Chamela, Jalisco, Mexico. Species, diversity, abundance, distribution and seasonal changes. *Folia Entomologica Mexicana* 77: 63–84.
Garnet, J.R., 1971. *The Wildflowers of Wilson's Promontory National Park.* Lothian: Melbourne.
Hagen, H., 1866. Psocinorum of Embidinorum Synopsis synonymica. *Verhandlungen. Zoologisch-Botanische Gesellschaft in Wien* 16: 201–222.
Heyden, G.H., 1850. Zwei neue deutsche Neuropter-engattungen. *Stettiner Entomologische Zeitung* 11: 83–85.
Hickman, V.V., 1934. A contribution to the study of Tasmanian Copeognatha. *Papers and Proceedings of the Royal Society of Tasmania* 1933: 77–89.
Jackson, W.D., 1965. Vegetation. Pp. 30–35 in: Davies, J.L. (Ed.) *Atlas of Tasmania.* Mercury Press: Hobart.
Jennings, J.N., 1959. The submarine topography of Bass Strait. *Proceedings of the Royal Society of Victoria* 71: 49–72.
Jentsch, S., 1939. Beiträge zur kenntnis de Überordnung Psocoidea. 8. Die Gattun *Ectopsocus* (Psocoptera). *Zoologischen Jahrbüchern. Abtheilung für Systematik, Geographie und Biologie der Thiere* 73: 111–128.
Kolbe, H.J., 1880. Monographie der deutschen Psociden mit besonderer Berücksichtigung der Fauna West-falens. *Jahresbericht des Westfälischen*

Provinzial-Vereins für Wissenschaft und Kunst 8: 73–142.

Kolbe, H.J., 1882. Neue Psociden der palaärktischen Region. *Entomologische Nachrichten* 8: 207–212.

Kolbe, H.J., 1883a. Ueber das Genu *Myopsocus* und dessen species. *Entomologische Nachrichten* 9: 141–146.

Kolbe, H.J., 1883b. Neue Psociden des Königl. zoologischen Museums zu Berlin. *Stettiner Entomologische Zeitung* 44: 65–87.

Lee, S.S. and Thornton, I.W.B., 1967. The family Pseudocaeciliidae (Psocoptera) – a reappraisal based on the discovery of new Oriental and Pacific species. *Pacific Insects Monograph* 16: 1–116.

Mackerras, I.M., 1970. Composition and distribution of the fauna. Pp. 187–203 in: *Insects of Australia*. CSIRO: Canberra.

McLachlan, R., 1866. New genera and species of Psocidae. *Transactions of the Entomological Society of London* 5: 345–352.

McLachlan, R., 1899. *Ectopsocus briggsi*, a new genus and species of Psocidae found in England. *Entomologist's Monthly Magazine* 35: 277–278.

Mockford, E.L., 1951. On two North American philotarsids (Psocoptera). *Psyche, a Journal of Entomology* 58: 102–107.

Mockford, E.L., 1959. The *Ectopsocus briggsi* complex in the Americas (Psocoptera, Peripsocidae). *Proceedings of the Entomological Society of Washington* 61: 260–266.

New, T.R., 1971. The Psocoptera of Curtis Island, Tasmania. *Journal of the Australian Entomological Society* 10: 223–229.

New, T.R., 1973a. New species and records of *Peripsocus* Hagen (Psocoptera, Peripsocidae) from southeast Australia. *Journal of the Australian Entomological Society* 12: 340–346.

New, T.R., 1973b. Two new Victorian species of *Ectopsocus* McLachlan (Psocoptera, Ectopsocidae). *Journal of the Australian Entomological Society* 12: 347–351.

New, T.R., 1974a. New species and records of Pseudocaeciliidae (Psocoptera) from southeast Australia. *Journal of the Australian Entomological Society* 13: 65–70.

New, T.R., 1974b. Psocidae (Psocoptera) from southern Australia. *Journal of the Australian Entomological Society* 13: 285–304.

New, T.R., 1977. Psocoptera of the Oriental region: a review. *Oriental Insects Supplementum* 6: 1–83.

Parsons, R.F., 1966. The soils and vegetation at Tidal River, Wilson's Promontory. *Proceedings of the Royal Society of Victoria* 79: 319–354.

Parsons, R.F., Kirkpatrick, J.B. and Carr, G.W., 1977. Native vegetation of the Otways region. *Proceedings of the Royal Society of Victoria* 89: 77–88.

Peck, O., 1951. Superfamily Chalcidoidea. In: Muesebeck, C.F.W., Krombein, K.V. and Townes, H.K. (Eds), Hymenoptera of North America north of Mexico, [synoptic catalog.]. *United States Department of Agriculture. Agriculture Monograph* 2: 410–594.

Perkins, R.C.L., 1899. *Fauna Hawaiiensis*. Cambridge.

Rawlinson, P.A., 1974. Biogeography and ecology of the reptiles of Tasmania and the Bass Strait area. Pp. 291–338 in: Williams, W.D. (Ed.), *Biogeography and ecology in Tasmania*. W. Junk: The Hague.

Reed, K.J., 1959. *The geology of Wilson's Promontory National Park*. Unpublished report. Australian Academy of Science/National Parks' Authority.

Roesler, R., 1943. Über einige Copcognathengenera. *Stettiner Entomologische Zeitung* 104: 1–14.

Roesler, R., 1944. Die Gattungen der Copeognathen. *Stettiner Entomologische Zeitung* 105: 117–166.

Smith, P.G., 1978. *The vegetation of Wilson's Promontory National Park*. National Parks Service, Victoria: Melbourne.

Smithers, C.N., 1962. Insects of Macquarie Island. Psocoptera: Philotarsidae. *Pacific Insects* 4: 929–932.

Smithers, C.N., 1963a. Two new genera of Elipsocidae (Psocoptera) from Australia. *Proceedings of the Royal Entomological Society of London* (B) 32: 32–37.

Smithers, C.N., 1963b. The Elipsocidae of Australia. *Pacific Insects* 5: 885–898.

Smithers, C.N., 1969. The Psocoptera of New Zealand. *Records of the Canterbury Museum* 8: 259–344.

Smithers, C.N., 1974. Two new species and additional records of *Taeniostigma* Enderlein (Psocoptera: Stenopsocidae) from Australia. *Journal of the Australian Entomological Society* 13: 211–217.

Smithers, C.N., 1975. The names of Australian and New Zealand Myopsocidae (Psocoptera). *Australian Entomological Magazine* 2: 76–78.

Smithers, C.N., 1976. The generic position of *Amphigerontia formosa* Banks (Psocoptera: Psocidae) and related species. *Australian Entomological Magazine* 3: 67–73.

Smithers, C.N., 1977. The Psocoptera of Muogamarra Nature Reserve. *Records of the Australian Museum* 31: 251–306.

Smithers, C.N., 1979. Three new species and some records of Psocoptera (Insecta) from Tasmania. *Australian Entomological Magazine* 6: 61–68.

Smithers, C.N., 1983. A reappraisal of *Clematostigma* Enderlein with notes on related genera (Psocoptera: Psocidae). *Australian Entomological Magazine* 9: 71–79.

Smithers, C.N., 1984. The Psocoptera of South Australia. *Records of the South Australian Museum* 18: 453–491.

Smithers, C.N. and Thornton, I.W.B., 1981. The Psocidae (Insecta: Psocoptera) of New Guinea, including a new coleopteriform genus from high on Mount Wilhelm. *Australian Journal of Zoology* 29: 921–969.

Smithers, C.N. and Thornton, I.W.B., 1990. Systematics and distribution of the Melanesian Psocidae

(Psocoptera). *Invertebrate Taxonomy* 3: 431–468.

Southwood, T.R.E., 1978. *Ecological Methods.* Chapman and Hall.

Taylor, L.R., Kempton, R.A. and Woiwood, I.P., 1976. Diversity statistics and the log-series model. *Journal of Animal Ecology* 45: 255–272.

Thomas, S.R., 1986. *A survey of the Psocopteran fauna at Cape Otway National Park, Victoria.* Unpublished Honours thesis, La Trobe University: Bundoora.

Thornton, I.W.B., 1959. A new genus of Philotarsidae (Corrodentia) and new species of this and related families from Hong Kong. *Transactions of the Royal Entomological Society of London* 111: 331–349.

Thornton, I.W.B., 1981. The systematics, phylogeny and biogeography of the Psocopteran family Philotarsidae. *Systematic Entomology* 6: 413–452.

Thornton, I.W.B., 1989. Psocoptera (Insecta) of the island of Moorea, French Polynesia, and comparisons with other Pacific island faunas. *Bulletin de Muséum National d'Histoire Naturelle, Paris (4)* 11: 783–828.

Thornton, I.W.B. and New, T.R., 1977. The Philotarsidae (Insecta: Psocoptera) of Australia. *Australian Journal of Zoology, Supplementary Series* 54: 1–62.

Thornton, I.W.B., New, T.R. and Vaughan, P.J., 1988. Colonisation of the Krakatau Islands by Psocoptera (Insecta). *Philosophical Transactions of the Royal Society of London* B 322: 427–443.

Thornton, I.W.B. and Wong, S.K., 1968. The peripsocid fauna (Psocoptera) of the Oriental Region and the Pacific. *Pacific Insects Monograph* 19: 1–158.

Thornton, I.W.B., Wong, S.K. and Smithers, C.N., 1977. The Philotarsidae (Psocoptera) of New Zealand and the islands of the New Zealand Plateau. *Pacific Insects* 17: 197–228.

Tillyard, R.J., 1923. A monograph of the Psocoptera, or Copeognatha, of New Zealand. *Transactions of the New Zealand Institute* 54: 170–196.

Zimmerman, E.C. 1957. *Insects of Hawaii.* Honolulu.